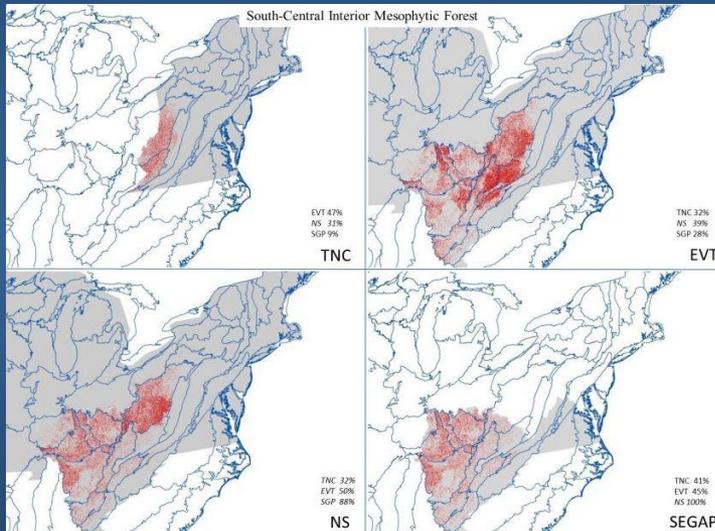


Comparison of the Maps



Lee Elliott & Dyanna
Pursell, MoRAP

13 June 2014



Comparison of Products

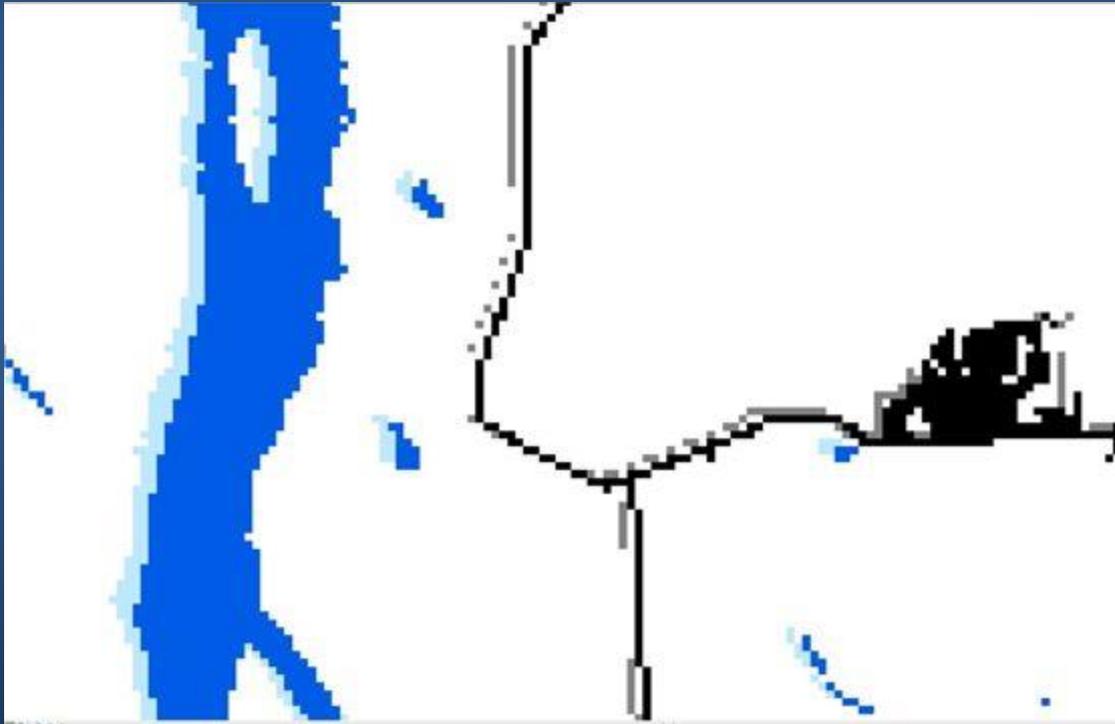
- Acquired Data – Input data may be older
 - TNC – 2012
 - EVT – 2008v1.1
 - NatureServe – v29 (post Mid-West updates)
 - SEGAP – 2008
- Clipped data to project area extent
- Registered rasters to each other
 - Edited headers to align pixels of each product to EVT
 - Problems with NatureServe map (shifts not consistent across extent)
- Standard or at least common legend across efforts (NatureServe lead)
- Reclass products to standard numeric code reflecting name in common legend
- Crosstab pairwise comparisons of each product to each other product, producing confusion matrix for each pair
- Compressed confusion matrix by eliminating large areas of these sparse matrices

Overlap Area – Virginia & Part of West Virginia

- Tabulate area by USFS Subsection
- Organized tabulations and summarized into manageable and interpretable scenarios

Issue with Map Registration - NatureServe

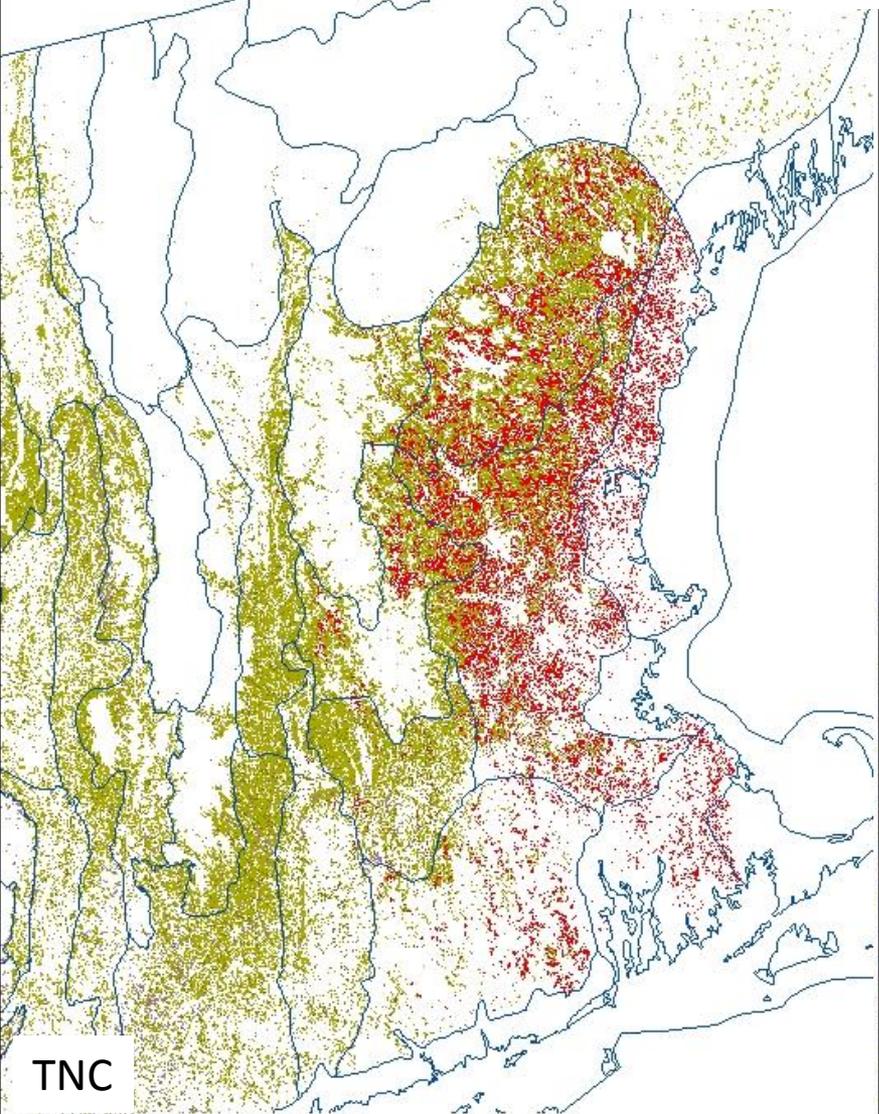
- Worse in some areas than others (worst area shown)
- Makes pixel by pixel comparison erroneous
- Summary by subsection used to overcome



General Reasons for Differences

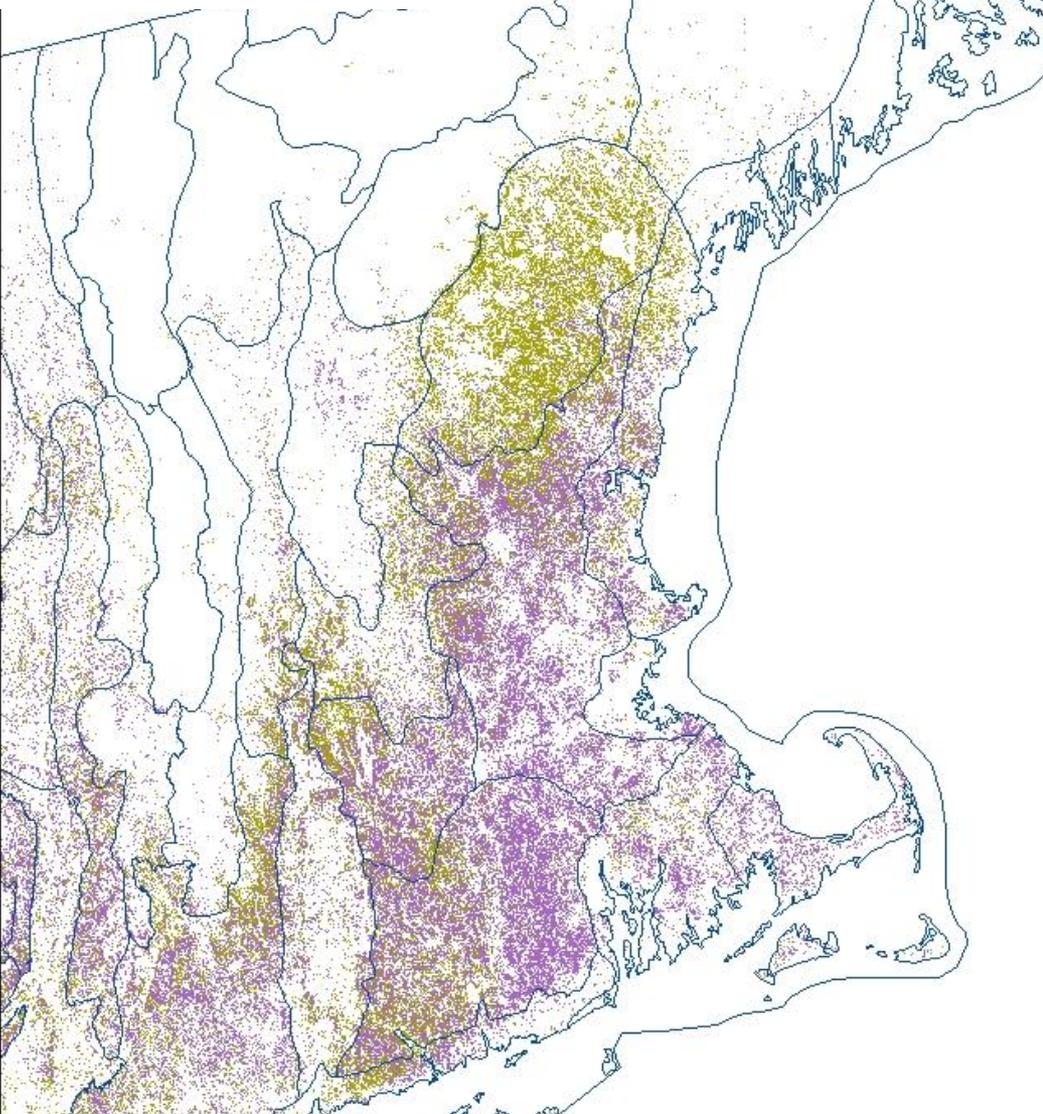
- Differences in Targets – Actual
- Differences in Targets – Conceptual
- Different Reliance on Geophysical Setting, Remote Sensing Data, & Plots
- Different Use of Range Restrictions
- Different Treatment of Non-natural and Semi-natural Types
- Deliberate Changes to Improve Product
- Different Methods – Obviously

Target Differences - Actual



TNC

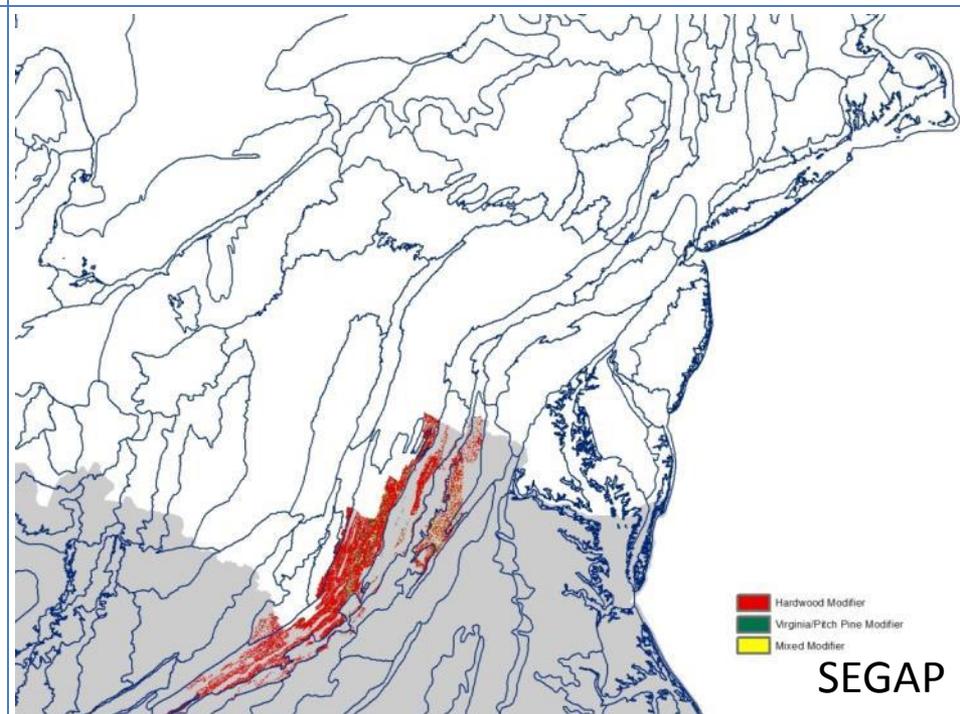
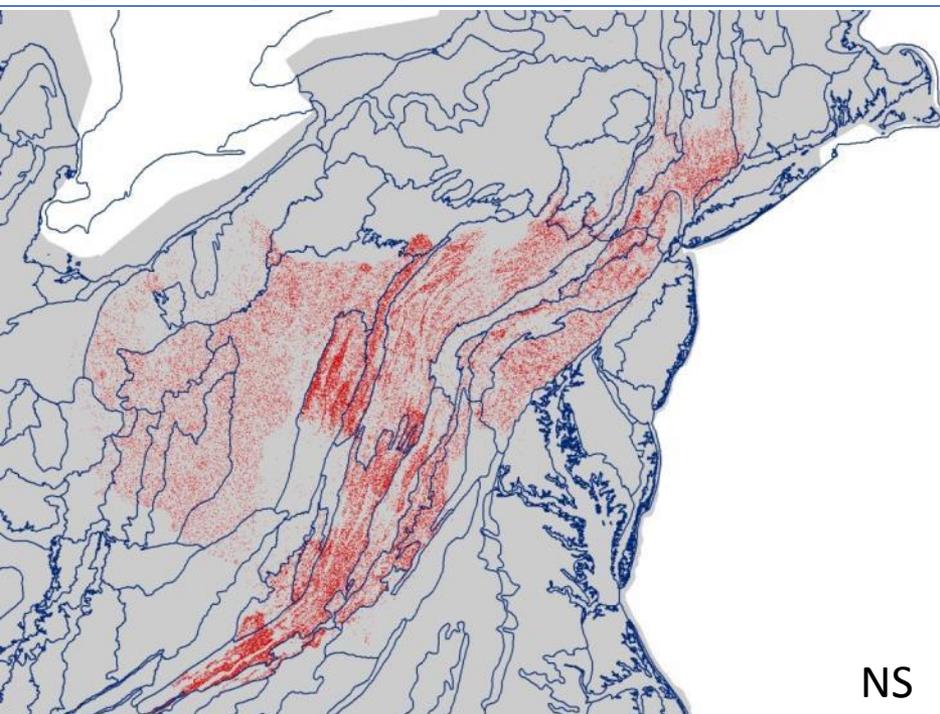
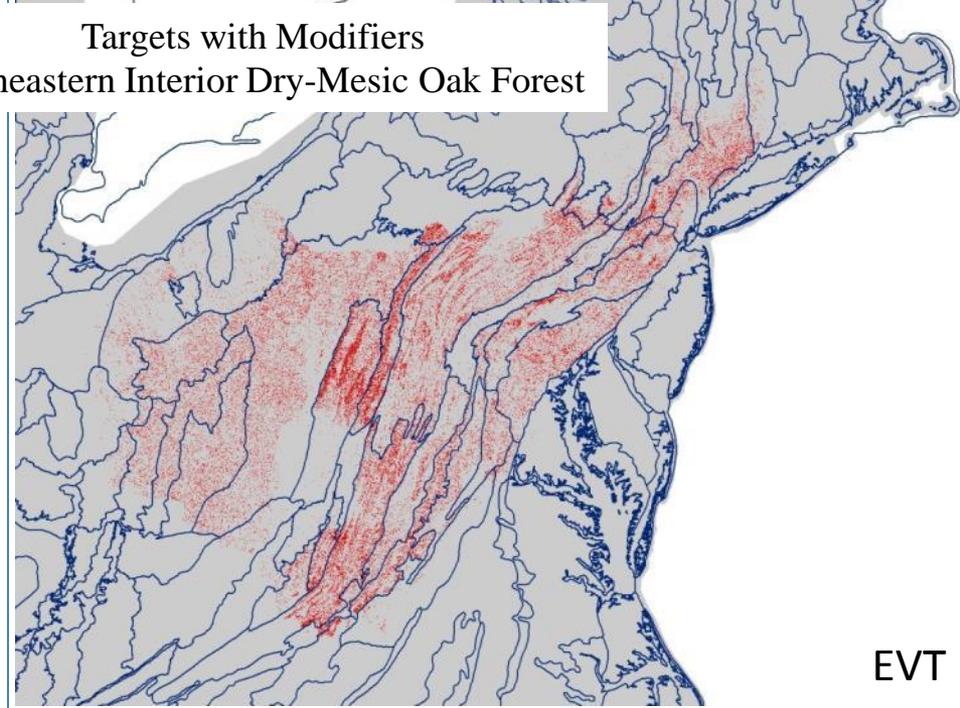
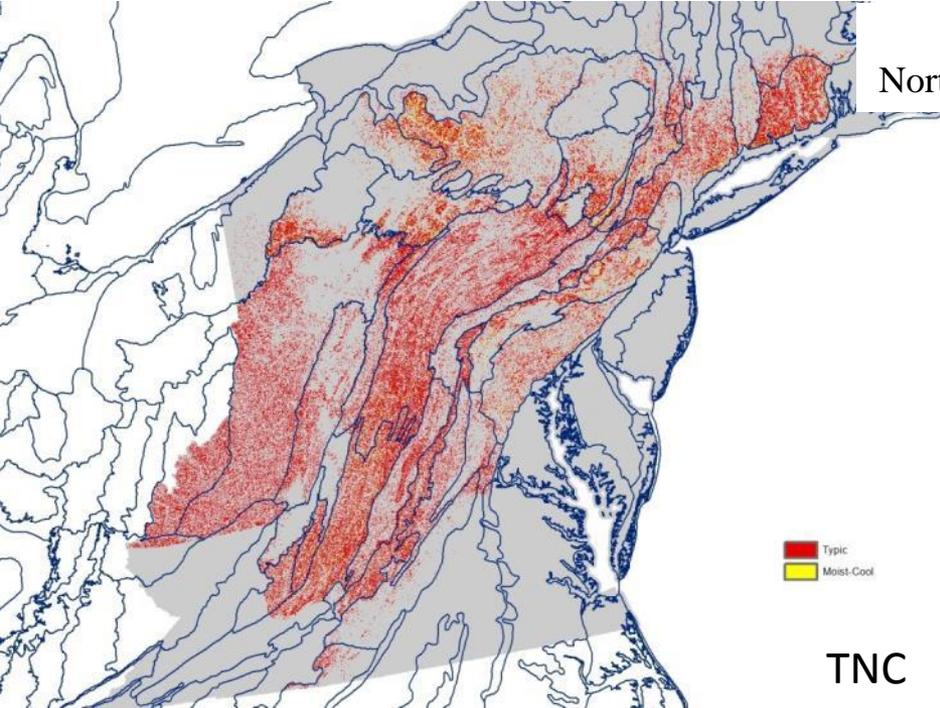
- Appalachian (Hemlock)-Northern Hardwood Forest: drier
- Appalachian (Hemlock)-Northern Hardwood Forest: moist-cool
- Appalachian (Hemlock)-Northern Hardwood Forest: typical
- Central Appalachian Dry Oak-Pine Forest
- Northeastern Coastal and Interior Pine-Oak Forest



EVT

- Appalachian (Hemlock)-Northern Hardwood Forest
- Central Appalachian Dry Oak-Pine Forest
- Northeastern Coastal and Interior Pine-Oak Forest

Targets with Modifiers
Northeastern Interior Dry-Mesic Oak Forest



Pixel by Pixel Comparison

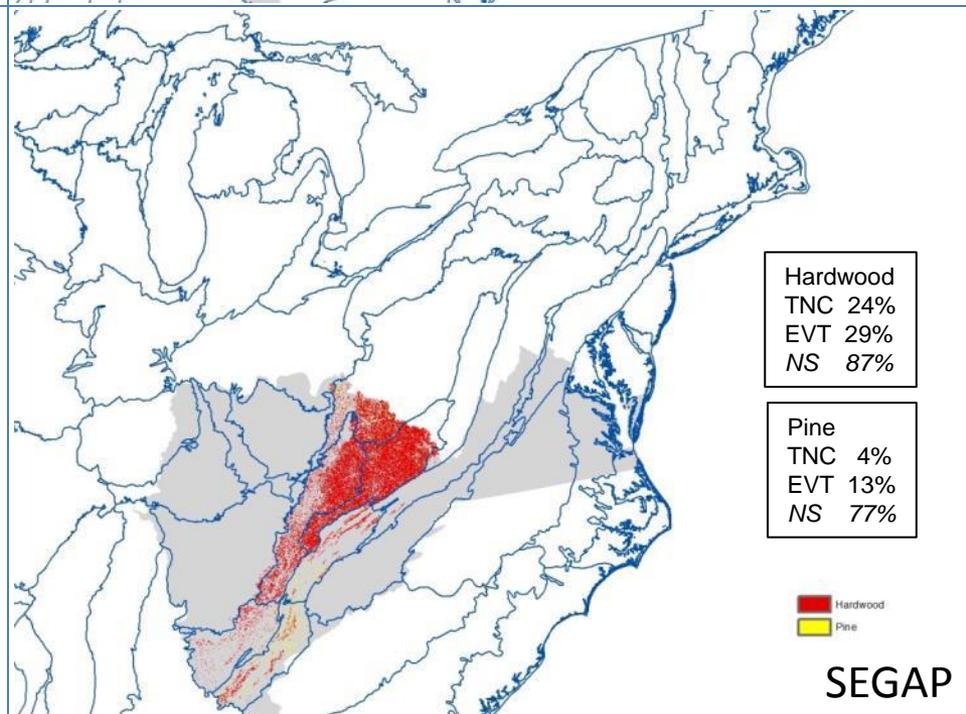
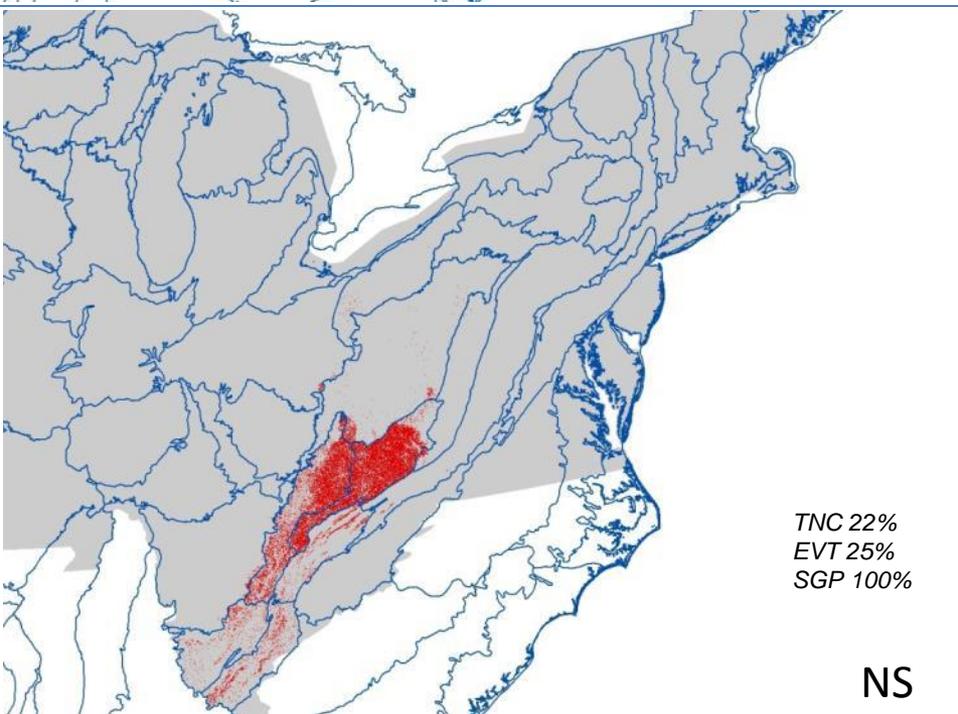
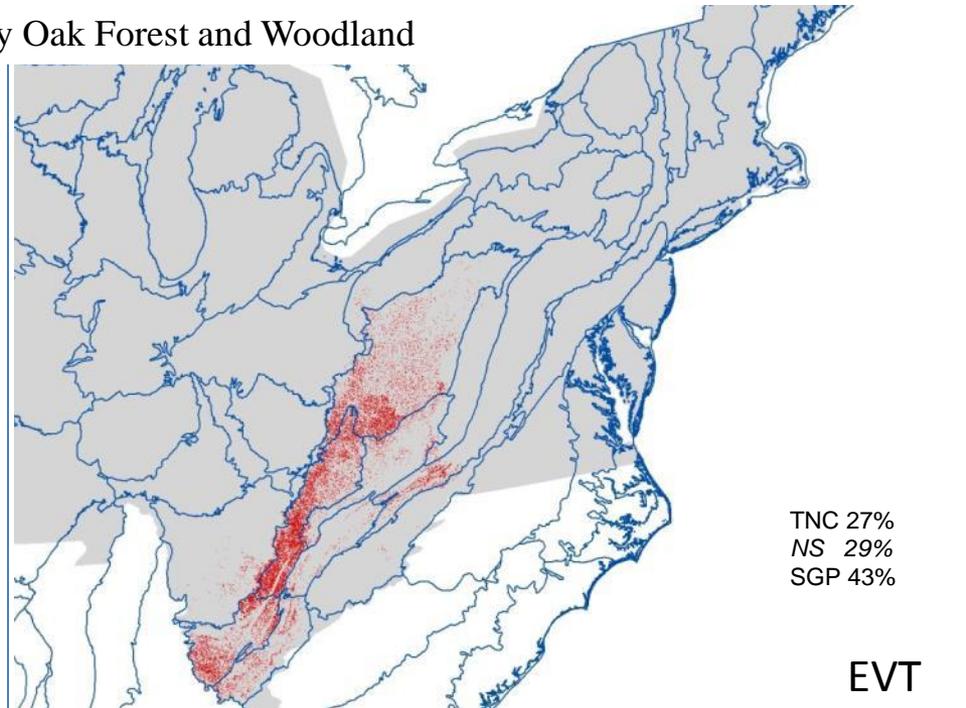
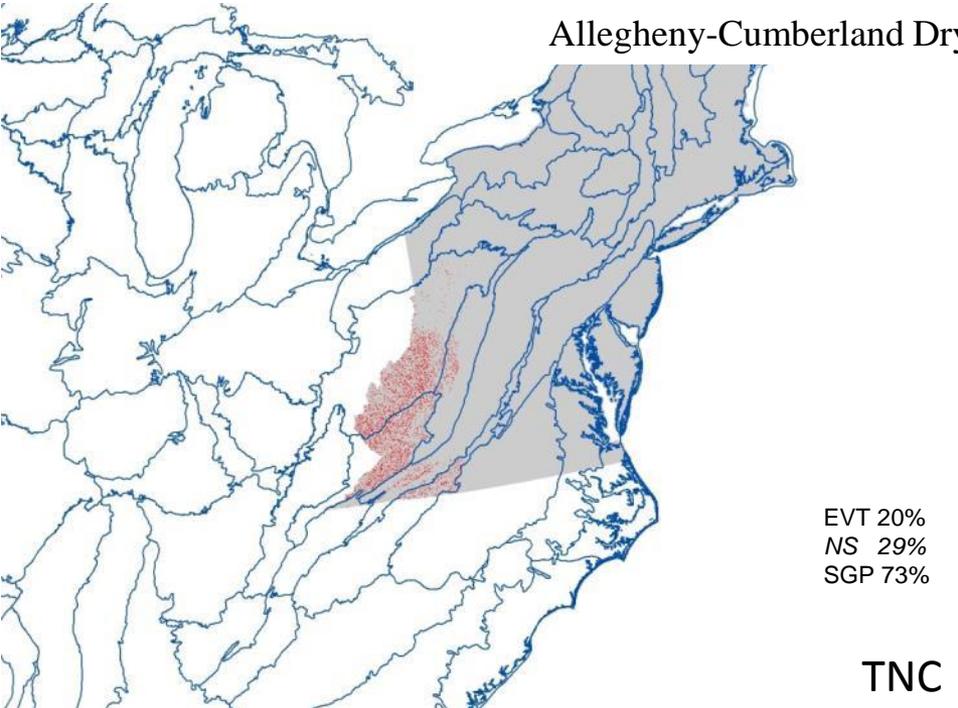
- Registered rasters to each other
- Common legend across efforts (NatureServe lead)
- Reclass products to standard numeric code reflecting name in common legend
- Crosstab pairwise comparisons of each product to each other product, producing confusion matrix for each pair
- Compressed confusion matrix by eliminating large areas of these sparse matrices

1	TNC	Col sum	%	EVT
2	Acadian Coastal Salt Marsh	51414	1.24%	Herbaceous Wetlands (73.98%); Acadian Salt Marsh and Estuary Systems
3	Acadian Estuary Marsh	53412	0.92%	Herbaceous Wetlands (78.50%); Acadian Salt Marsh and Estuary Systems
4	Acadian Low-Elevation Spruce-Fir-Hardwood Forest	24834054	50.93%	Acadian Low-Elevation Spruce-Fir-Hardwood Forest (50.93%); Laurentian-Acadian Northern Hardwoods Forest (26.96%)
5	Acadian Maritime Bog	23540	33.38%	Boreal Acidic Peatland Systems (33.38%); Herbaceous Wetlands (21.33%); Laurentian-Acadian Pine-Hemlock-Hardwood Forest (18.85%)
6	Acadian Sub-boreal Spruce Flat	6803653	0.00%	Acadian Low-Elevation Spruce-Fir-Hardwood Forest (64.13%); Laurentian-Acadian Swamp Systems (14.74%)
7	Acadian-Appalachian Alpine Tundra	36805	12.69%	Barren (47.96%); Acadian-Appalachian Montane Spruce-Fir Forest (19.63%); Laurentian-Acadian Northern Hardwoods Forest (13.43%); Acadian-Appalachian Alpine Tundra (12.69%)
8	Acadian-Appalachian Montane Spruce-Fir Forest	4875555	79.84%	Acadian-Appalachian Montane Spruce-Fir Forest (79.84%); Laurentian-Acadian Northern Hardwoods Forest (18.77%)
9	Acadian-North Atlantic Rocky Coast	34653	0.00%	Herbaceous Wetlands (22.39%); Barren (20.76%)
10	Agriculture - General	125337924	97.82%	NASS-Close Grown Crop (33.99%); Agriculture - Pasture/Hay (23.17%); NASS-Row Crop (19.61%) Agriculture - Cultivated Crops and Irrigated Agriculture; Agriculture - Pasture/Hay; NASS-Bush Fruit and Berries; NASS-Fallow/Idle Cropland; NASS-Orchard; NASS-Row Crop-Close Grown Crop; NASS-Vineyard
	Allegheny-Cumberland Dry Oak Forest and			South-Central Interior Mesophytic Forest (38.68%); Allegheny-Cumberland Dry Oak Forest and Woodland (19.89%); Southern and Central Appalachian Cove Forest (13.98%);

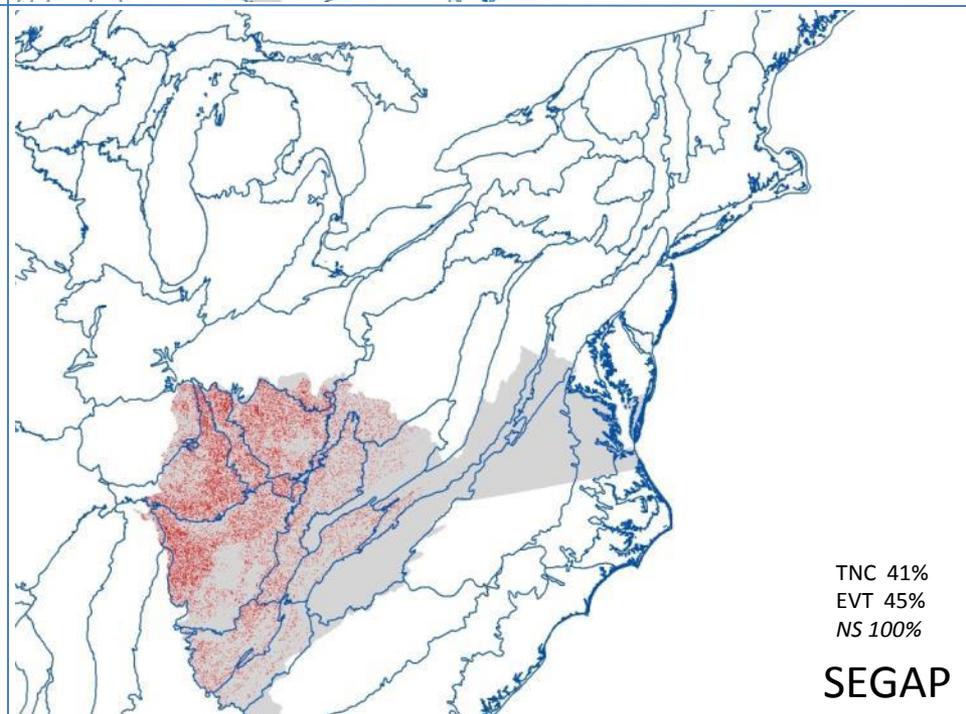
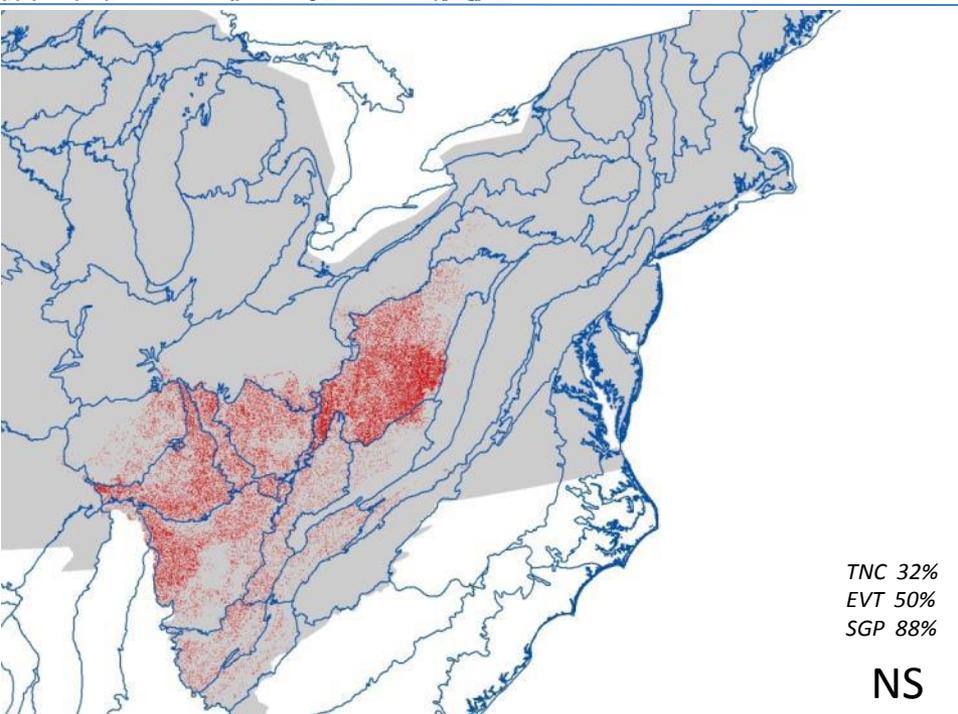
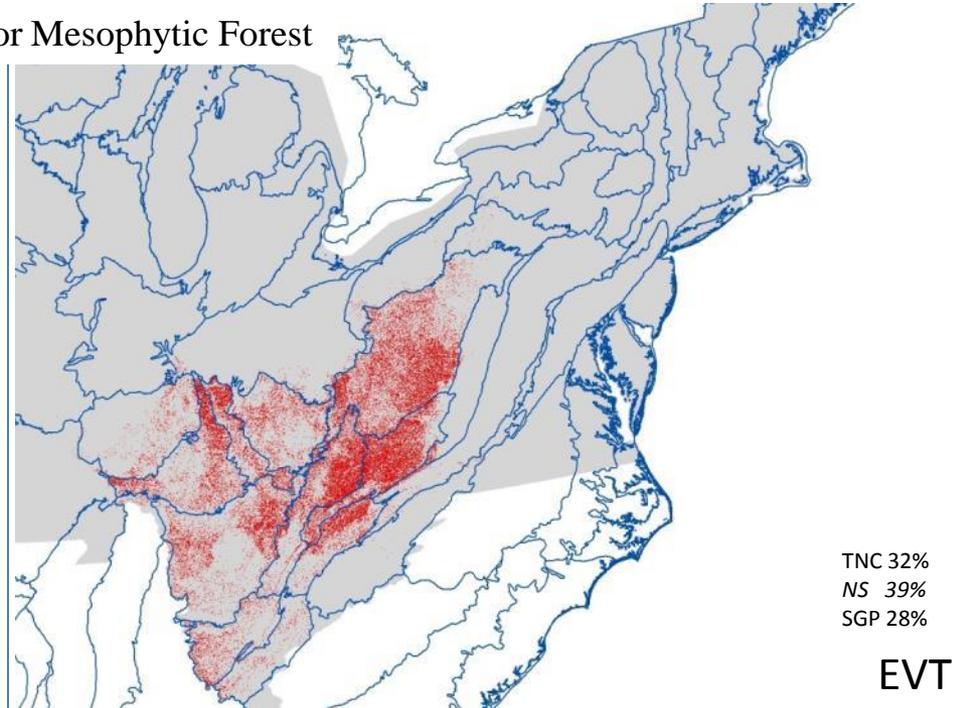
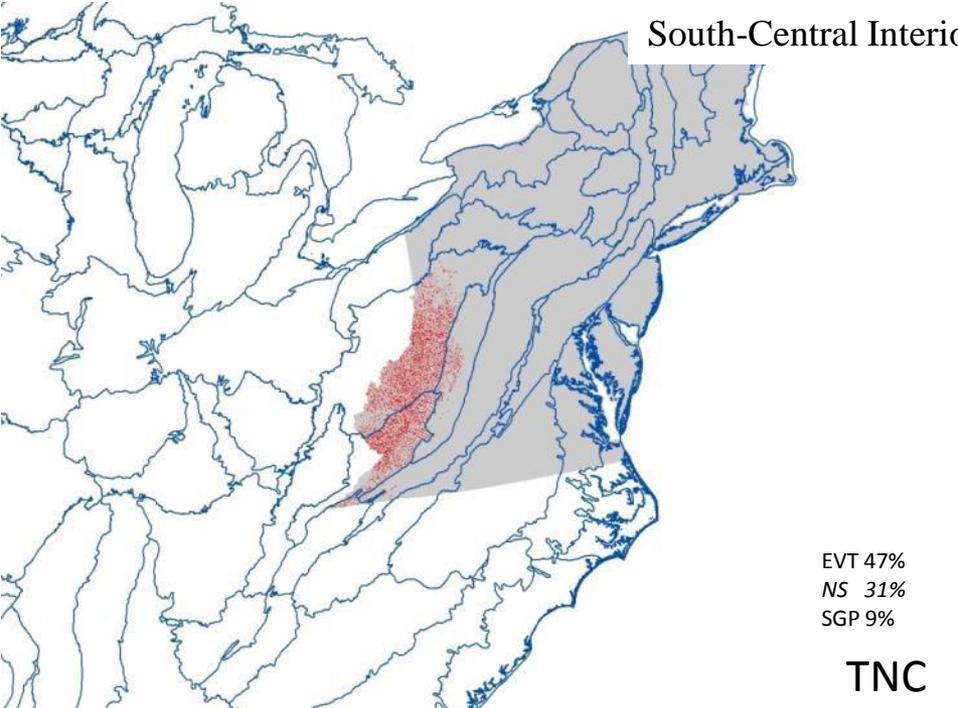
- Pairwise
- Not Symmetric
- <190 Rows
- 4 Columns
- Explicitly IDs Confusion
- Immune to Different Extents
- Sensitive to Pixel Registration

1	EVT	Row Sum	%	TNC
2	Acadian Low-Elevation Spruce-Fir-Hardwood Forest	30668104	41.24%	Acadian Low-Elevation Spruce-Fir-Hardwood Forest (41.24%); Laurentian-Acadian Pine-Hemlock-Hardwood Forest: typic (16.73%); Acadian Sub-boreal Spruce Flat (14.23%)
3	Acadian Salt Marsh and Estuary Systems	15916	7.11%	Open Water (27.41%) Acadian Coastal Salt Marsh Acadian Estuary Marsh
4	Acadian-Appalachian Alpine Tundra	12653	36.92%	Acadian-Appalachian Montane Spruce-Fir Forest (41.74%); Acadian-Appalachian Alpine Tundra (36.92%); Laurentian-Acadian Acidic Cliff and Talus (15.97%)
5	Acadian-Appalachian Montane Spruce-Fir Forest	11828327	32.91%	Acadian-Appalachian Montane Spruce-Fir Forest (32.91%); Laurentian-Acadian Northern Hardwood Forest: typic (22.51%); Acadian Low-Elevation Spruce-Fir-Hardwood Forest (13.56%); Laurentian-Acadian Northern Hardwood Forest_high conifer (10.90%)
6	Acadian-Appalachian Subalpine Woodland and Heath-Krummholz	28931	0.00%	Acadian-Appalachian Montane Spruce-Fir Forest (63.12%); Laurentian-Acadian Calcareous Rocky Outcrop (14.42%)
7	Agriculture - Cultivated Crops and Irrigated Agriculture	13556391	91.50%	Agriculture - General (91.50%)
8	Agriculture - Pasture/Hay	30890112	94.00%	Agriculture - General (94.00%)
9	Allegheny-Cumberland Dry Oak Forest and Woodland	7616587	26.69%	Allegheny-Cumberland Dry Oak Forest and Woodland (26.69%); Northeastern Interior Dry-Mesic Oak Forest: typic (23.73%); Southern Appalachian Oak Forest: typic (21.94%); South-Central Interior Mesophytic Forest (13.57%)
	Appalachian (Hemlock)-Northern			Appalachian (Hemlock)-Northern Hardwood Forest: typic (38.61%); Northeastern Interior Dry-Mesic Oak Forest: typic (21.98%) Appalachian (Hemlock)-Northern Hardwood Forest: drier Appalachian (Hemlock)-Northern

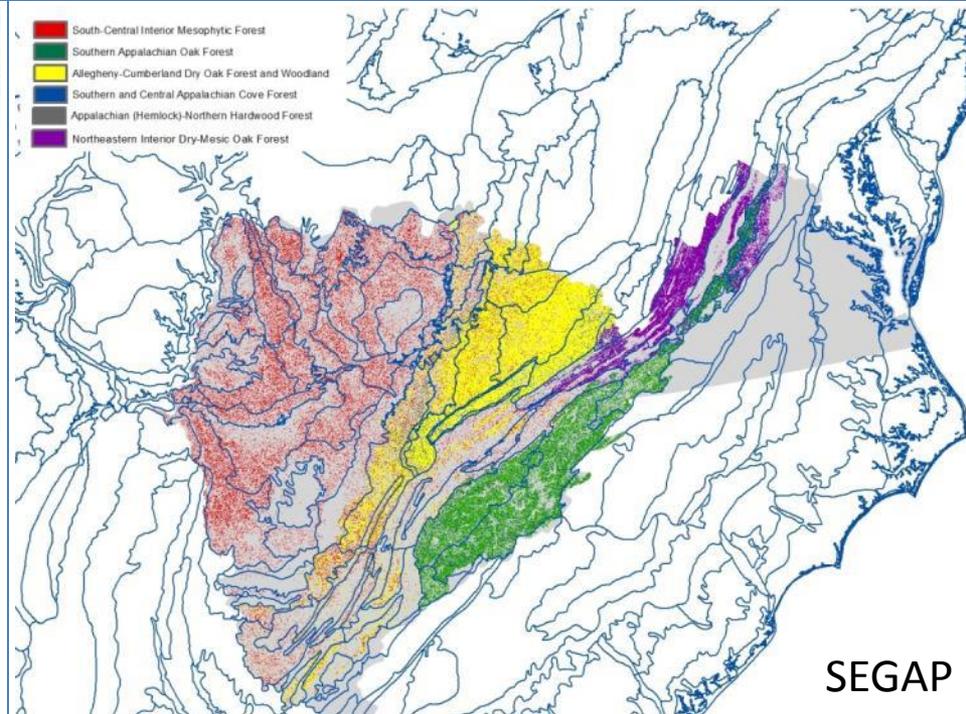
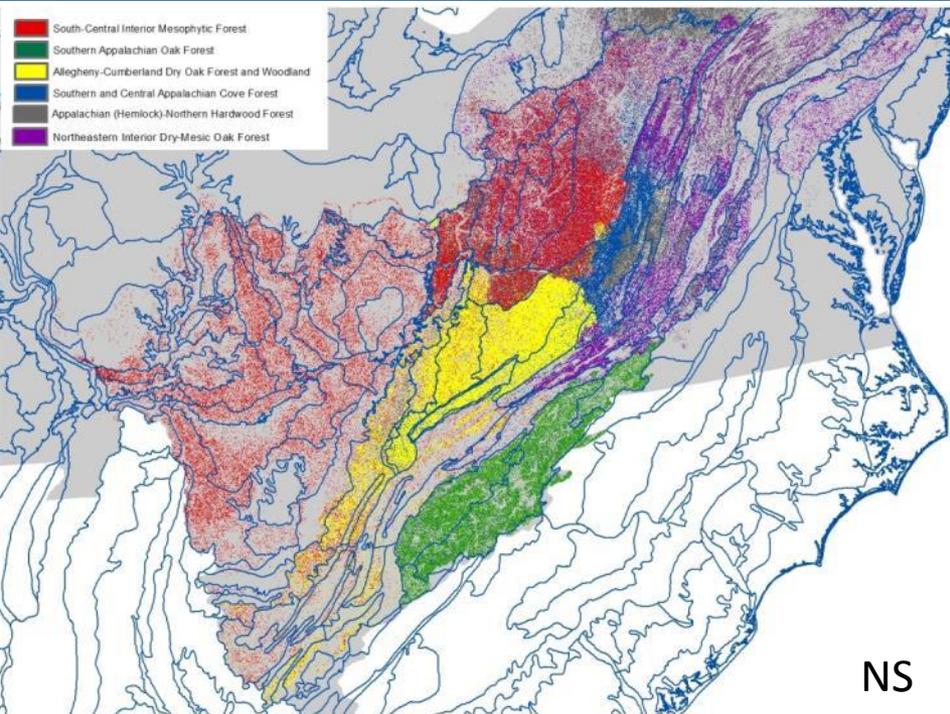
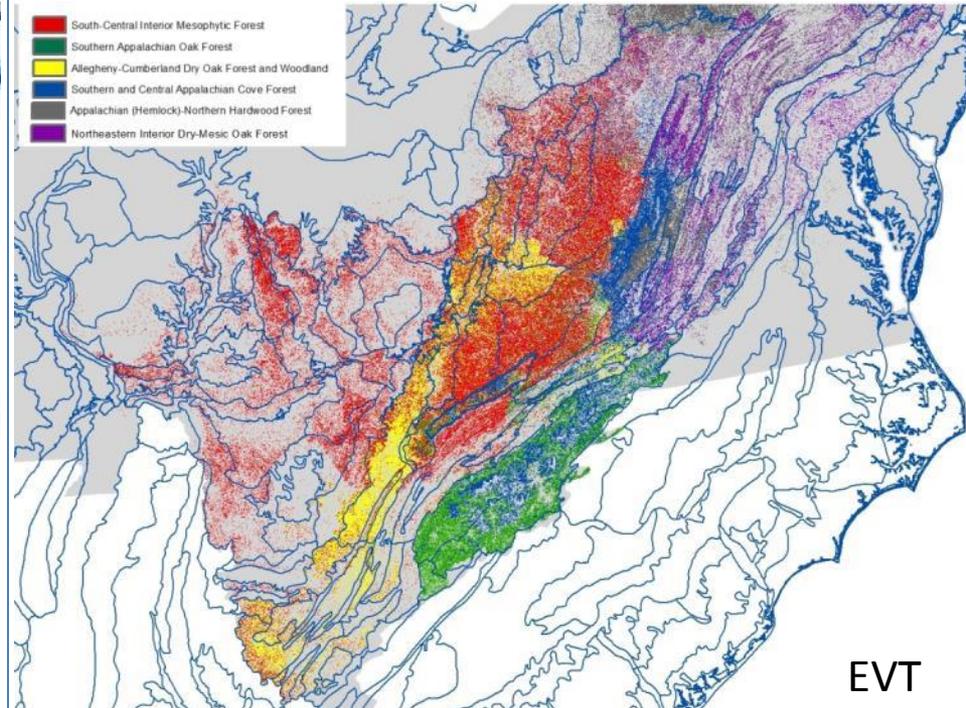
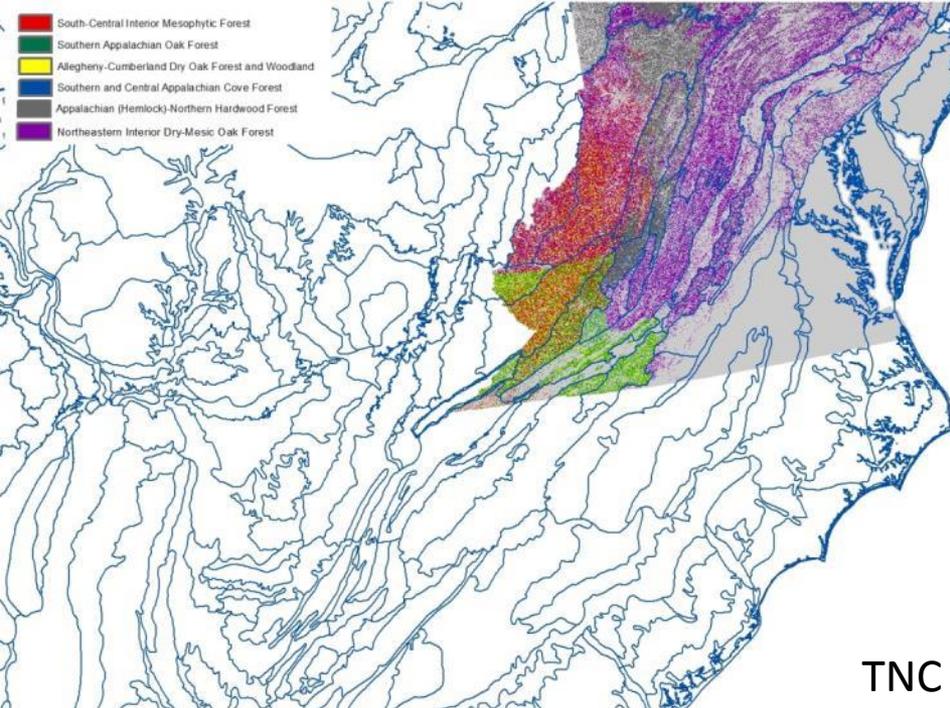
Allegheny-Cumberland Dry Oak Forest and Woodland



South-Central Interior Mesophytic Forest

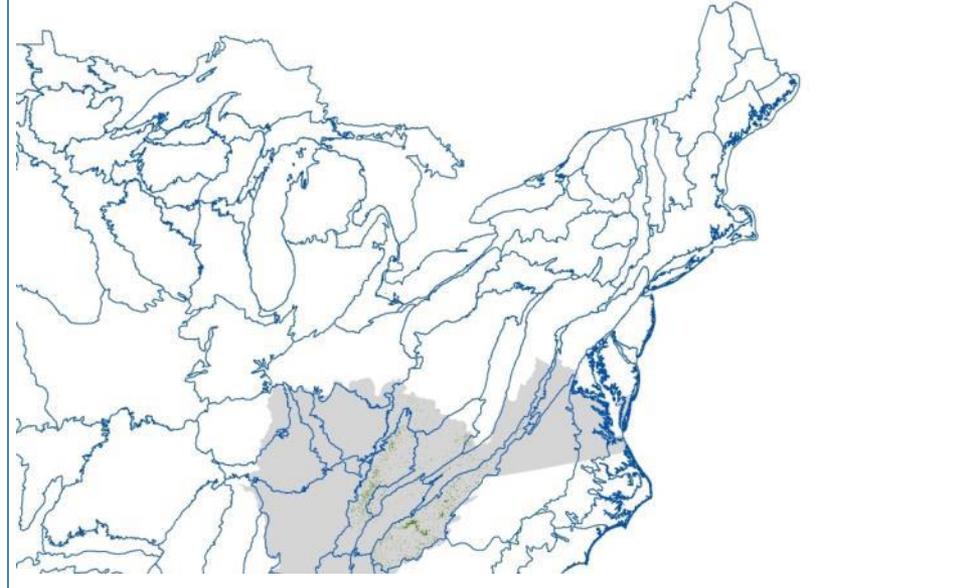
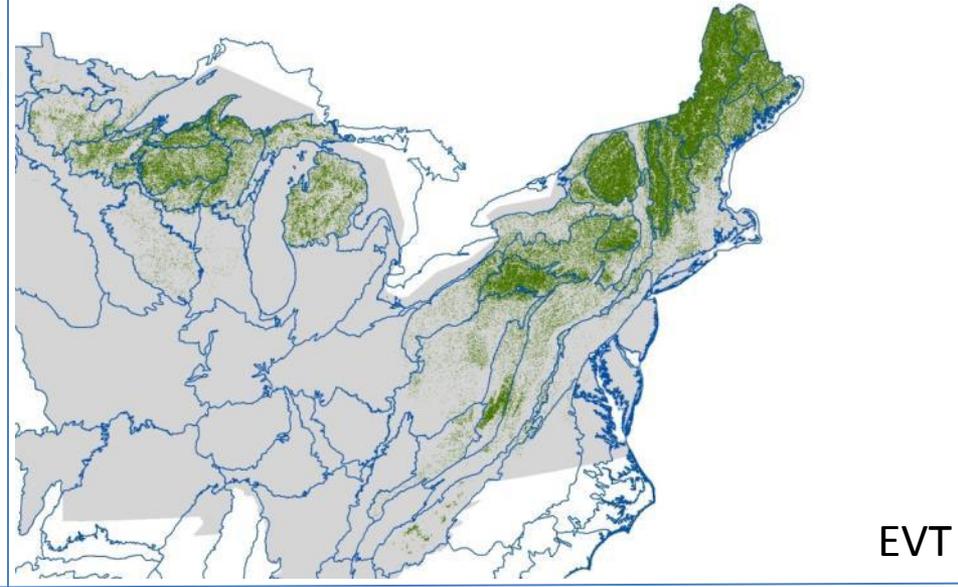
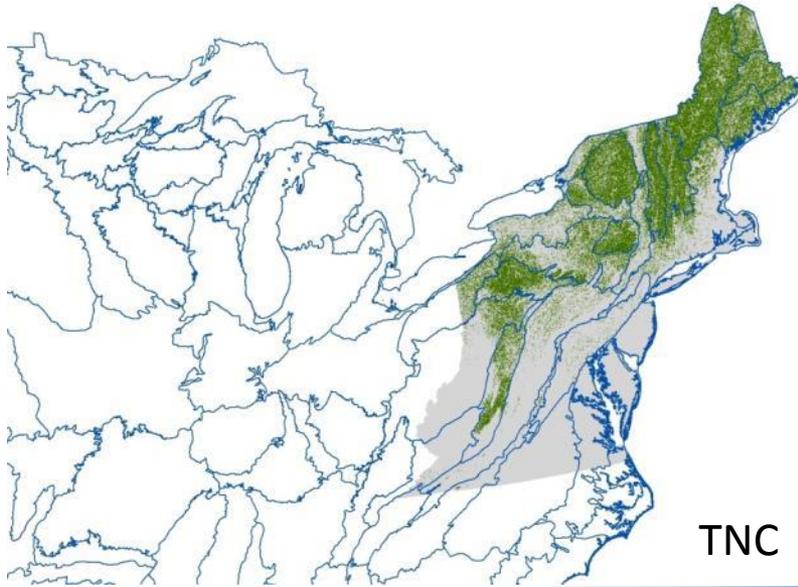


EVT	SEGAP	TNC
Allegheny-Cumberland Dry Oak Forest and Woodland	<u>Allegheny-Cumberland Dry Oak Forest and Woodland - Hardwood (41.92%);</u> Southern Ridge and Valley Dry Calcareous Forest - Hardwood (25.44%); South-Central Interior Mesophytic Forest (10.07%) <u>Allegheny-Cumberland Dry Oak Forest and Woodland - Pine Modifier</u>	<u>Allegheny-Cumberland Dry Oak Forest and Woodland (26.69%);</u> Northeastern Interior Dry-Mesic Oak Forest: typic (23.73%); Southern Appalachian Oak Forest: typic (21.94%); South-Central Interior Mesophytic Forest (13.57%)
Appalachian (Hemlock)-Northern Hardwood Forest	Northeastern Interior Dry Oak Forest-Hardwood Modifier (42.89%); Southern and Central Appalachian Cove Forest (12.52%) <u>Appalachian (Hemlock)-Northern Hardwood Forest</u>	<u>Appalachian (Hemlock)-Northern Hardwood Forest: typic (38.61%);</u> Northeastern Interior Dry-Mesic Oak Forest: typic (21.98%) <u>Appalachian (Hemlock)-Northern Hardwood Forest: drier</u> <u>Appalachian (Hemlock)-Northern Hardwood Forest: moist-cool</u>
Northeastern Interior Dry-Mesic Oak Forest	<u>Northeastern Interior Dry Oak Forest-Hardwood Modifier (45.31%);</u> Southern Ridge and Valley Dry Calcareous Forest - Hardwood (14.78%); Southern and Central Appalachian Cove Forest (11.35%) <u>Northeastern Interior Dry Oak Forest - Mixed Modifier</u> <u>Northeastern Interior Dry Oak Forest - Virginia/Pitch Modifier</u>	<u>Northeastern Interior Dry-Mesic Oak Forest: typic (44.90%);</u> Appalachian (Hemlock)-Northern Hardwood Forest: typic (16.89%); Central Appalachian Dry Oak-Pine Forest (11.85%) <u>Northeastern Interior Dry-Mesic Oak Forest: moist-cool</u>
South-Central Interior Mesophytic Forest	Allegheny-Cumberland Dry Oak Forest and Woodland - Hardwood (31.67%); <u>South-Central Interior Mesophytic Forest (27.57%);</u> Southern Interior Low Plateau Dry-Mesic Oak Forest (19.38%)	<u>South-Central Interior Mesophytic Forest (32.41%);</u> Northeastern Interior Dry-Mesic Oak Forest: typic (22.60%); Allegheny-Cumberland Dry Oak Forest and Woodland (17.02%); Southern Appalachian Oak Forest: typic (16.79%)
Southern and Central Appalachian Cove Forest	Southern Appalachian Oak Forest (28.52%); Southern and Central Appalachian Oak Forest - Xeric (15.57%); <u>Southern and Central Appalachian Cove Forest (13.77%);</u> Northeastern Interior Dry Oak Forest-Hardwood Modifier (10.13%)	Northeastern Interior Dry-Mesic Oak Forest: typic (22.24%); Southern Appalachian Oak Forest: typic (18.54%); South-Central Interior Mesophytic Forest (12.25%) <u>Southern and Central Appalachian Cove Forest-- acidic</u> <u>Southern and Central Appalachian Cove Forest-- calcareous</u> <u>Southern and Central Appalachian Cove Forest-- circumneutral</u>
Southern Appalachian Oak Forest	<u>Southern Appalachian Oak Forest (26.83%);</u> <u>Southern and Central Appalachian Oak Forest - Xeric (24.45%);</u> Allegheny-Cumberland Dry Oak Forest and Woodland - Hardwood (15.26%); Southern and Central Appalachian Cove Forest (10.77%)	<u>Southern Appalachian Oak Forest: typic (44.80%);</u> Allegheny-Cumberland Dry Oak Forest and Woodland (25.80%) <u>Southern Appalachian Oak Forest: moist-cool</u>



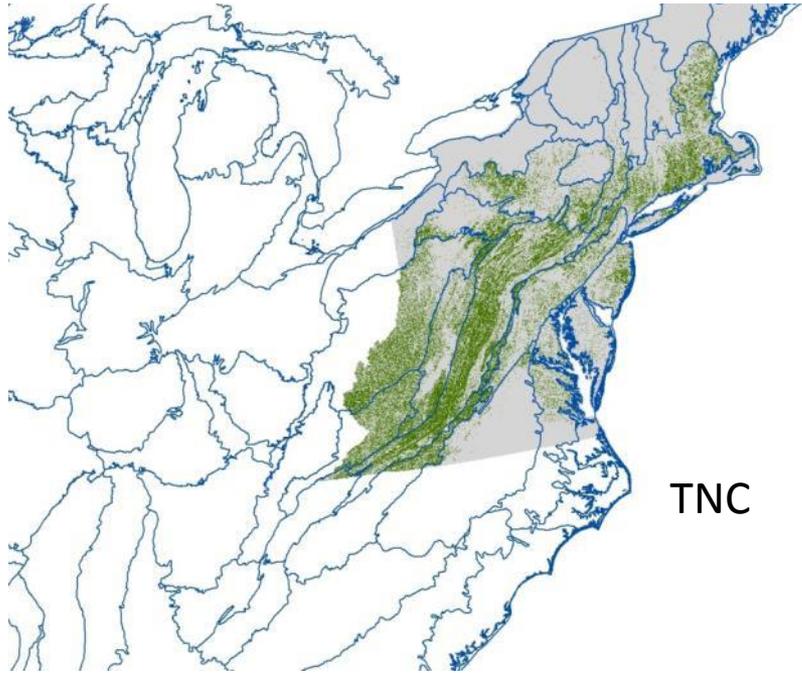
Northern Mesic Hardwood & Conifer Forest Macrogroup

Acadian Low-Elevation Spruce-Fir-Hardwood Forest; Acadian-Appalachian Montane Spruce-Fir Forest; Appalachian (Hemlock)-Northern Hardwood Forest; Central & Southern Appalachian Spruce-Fir Forest; Laurentian-Acadian Northern Hardwoods Forest; Laurentian-Acadian Pine-Hemlock-Hardwood Forest; Southern Appalachian Northern Hardwood Forest

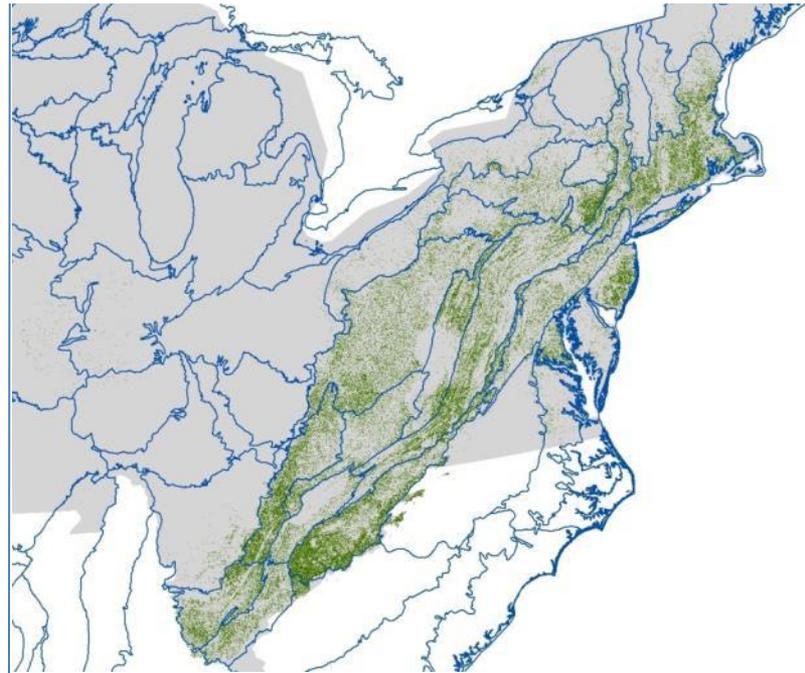


Appalachian_Northeastern Oak-Hardwood & Pine Forest Macrogroup

Allegheny-Cumberland Dry Oak Forest and Woodland; Central and Southern Appalachian Montane Oak Forest; Central Appalachian Dry Oak-Pine Forest; Central Appalachian Pine-Oak Rocky Woodland; Northeastern Coastal and Interior Pine-Oak Forest; Northeastern Interior Dry-Mesic Oak Forest; North Atlantic Coastal Plain Hardwood Forest; Southern Appalachian Oak Forest



TNC



EVT

Average Match for Systems= 21%
Match for Macrogroup = 66%

EVT

Allegheny-Cumberland Dry Oak Forest and Woodland	7616587	26.69%
--	---------	--------

TNC

Allegheny-Cumberland Dry Oak Forest and Woodland (26.69%);
Northeastern Interior Dry-Mesic Oak Forest: typic (23.73%);
Southern Appalachian Oak Forest: typic (21.94%);
South-Central Interior Mesophytic Forest (13.57%)

TNC

Allegheny-Cumberland Dry Oak Forest and Woodland	10221777	19.89%
--	----------	--------

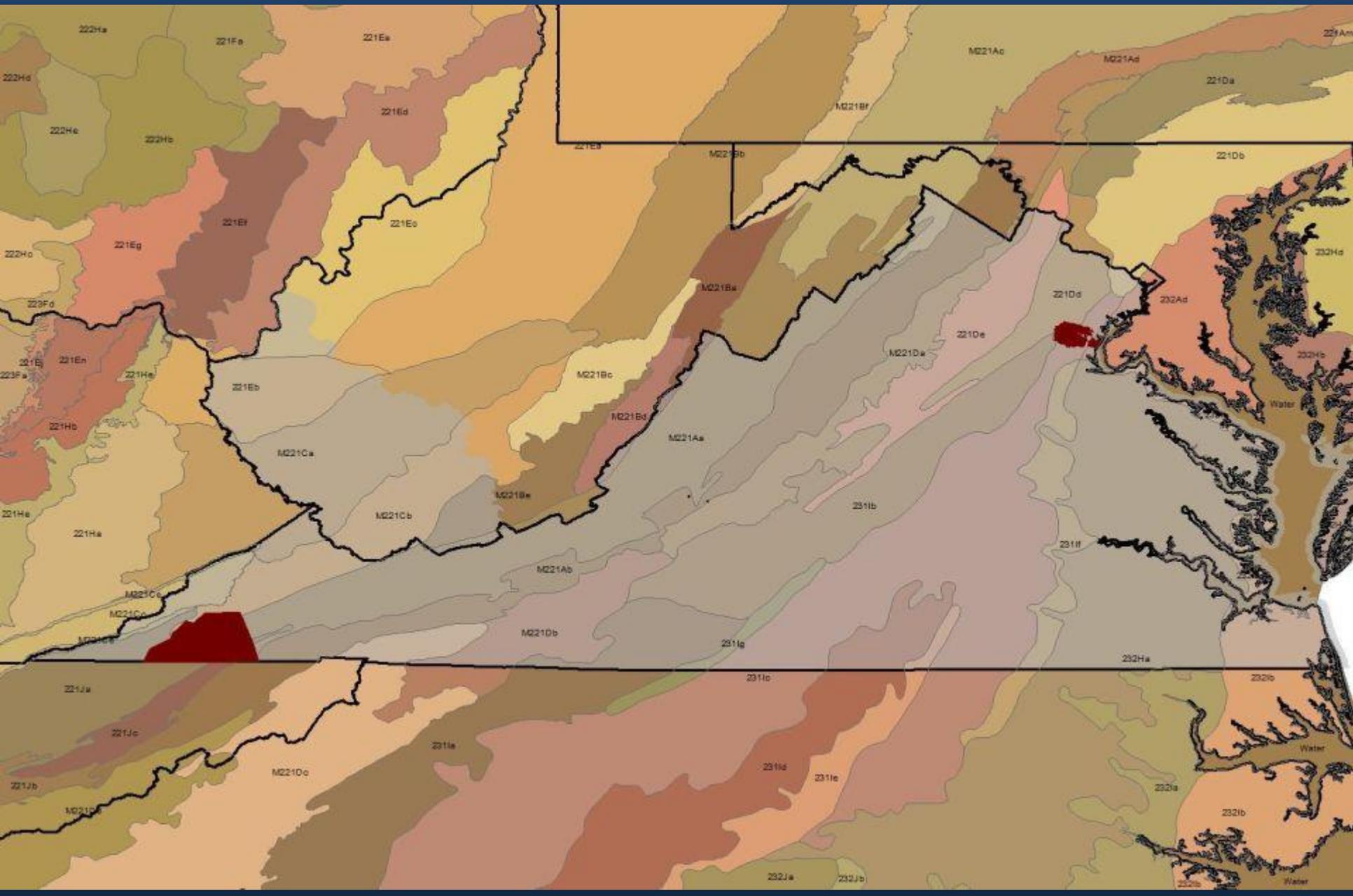
EVT

South-Central Interior Mesophytic Forest (38.68%);
Allegheny-Cumberland Dry Oak Forest and Woodland (19.89%);
Southern and Central Appalachian Cove Forest (13.98%);
Southern Appalachian Oak Forest (10.07%)

Comparison by Subsection in Overlap Zone

- Common legend across efforts (NatureServe lead)
- Reclass products to standard numeric code reflecting name in common legend
- Clipped to region of overlap among all four products
- Tabulate area by USFS Subsection
- Organized tabulations and summarized into manageable and interpretable scenarios

Area of Overlap

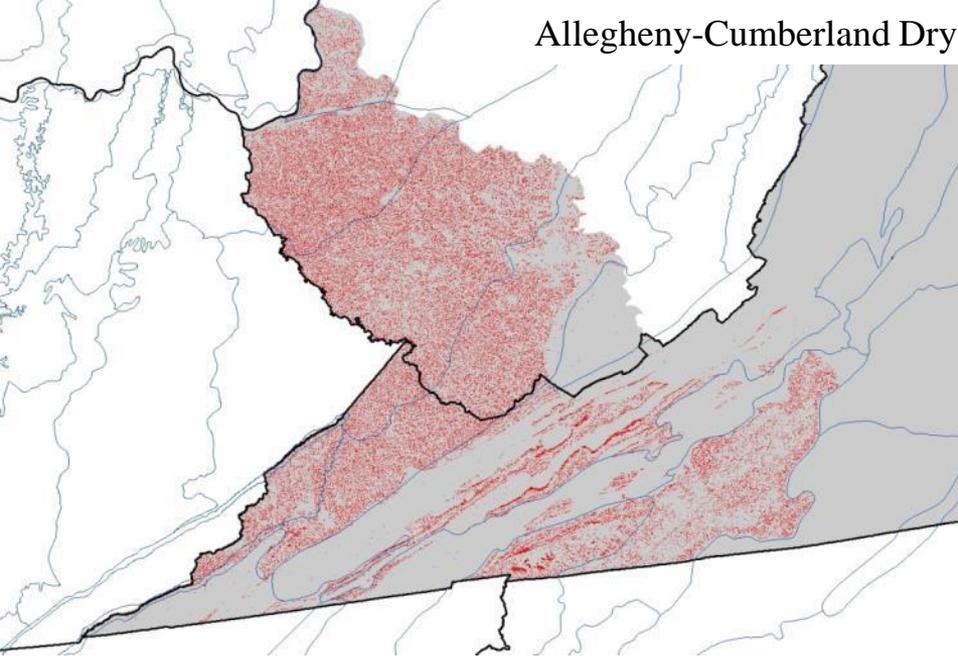


Subsection	Type	Percent of Area Mapped in Subsection			
		evt	nat	segap	tnc
221Db	Appalachian (Hemlock)-Northern Hardwood Forest	3.60	0.00	0.00	10.11
221Db	Central Appalachian Dry Oak-Pine Forest	1.30	23.11	23.11	0.32
221Db	Ruderal Forest	14.61			
221Dd	Central Appalachian Dry Oak-Pine Forest	2.53	23.03	22.60	0.50
221Dd	Northeastern Interior Dry-Mesic Oak Forest	10.29	0.98	2.99	11.93
221Dd	Ruderal Forest	14.18			
221Dd	Southern Piedmont Mesic Forest	6.46	1.04	0.00	12.74
221De	Northeastern Interior Dry-Mesic Oak Forest	8.85	18.37	34.02	21.66
221De	Ruderal Forest	14.64			
221De	Southern Piedmont Mesic Forest	7.00	4.94	0.54	17.10
221Ea	Allegheny-Cumberland Dry Oak Forest and Woodland	40.23	0.96	58.61	12.34
221Ea	Appalachian (Hemlock)-Northern Hardwood Forest	0.01	28.34	0.74	
221Ea	Northeastern Interior Dry-Mesic Oak Forest	0.00			30.88
221Ea	South-Central Interior Mesophytic Forest	15.72	38.87	8.82	20.92
221Eb	Allegheny-Cumberland Dry Oak Forest and Woodland	45.74	3.04	73.07	22.28
221Eb	Appalachian (Hemlock)-Northern Hardwood Forest		36.09	0.88	
221Eb	South-Central Interior Mesophytic Forest	30.66	43.41	8.59	12.74
221Eb	Southern Appalachian Oak Forest	0.01			34.75
221Ec	Allegheny-Cumberland Dry Oak Forest and Woodland	47.89	0.80	67.42	13.56
221Ec	Appalachian (Hemlock)-Northern Hardwood Forest	0.00	34.95	1.58	0.03
221Ec	Northeastern Interior Dry-Mesic Oak Forest	0.00	0.00		36.10
221Ec	South-Central Interior Mesophytic Forest	16.14	41.81	8.56	23.86
221Ed	Allegheny-Cumberland Dry Oak Forest and Woodland	8.21	0.85	17.55	4.29
221Ja	Allegheny-Cumberland Dry Oak Forest and Woodland	4.16	17.79	17.79	3.12
221Ja	South-Central Interior Mesophytic Forest	41.61	8.30	8.30	13.79
221Ja	Southern Appalachian Oak Forest	7.20	0.00	0.00	10.95
221Ja	Southern Ridge and Valley / Cumberland Dry Calcareous Forest	1.40	20.38	20.38	30.55
221Ja	Successional Grassland & Shrubland	4.91	16.94	17.27	15.88
221Jc	Southern and Central Appalachian Cove Forest	18.89	0.68	0.66	
221Jc	Southern Ridge and Valley / Cumberland Dry Calcareous Forest	2.54	49.01	49.01	29.70
231Ia	Northeastern Interior Dry-Mesic Oak Forest				11.39
231Ia	Southern Piedmont Dry Oak-(Pine) Forest	33.28	51.87	52.05	21.79

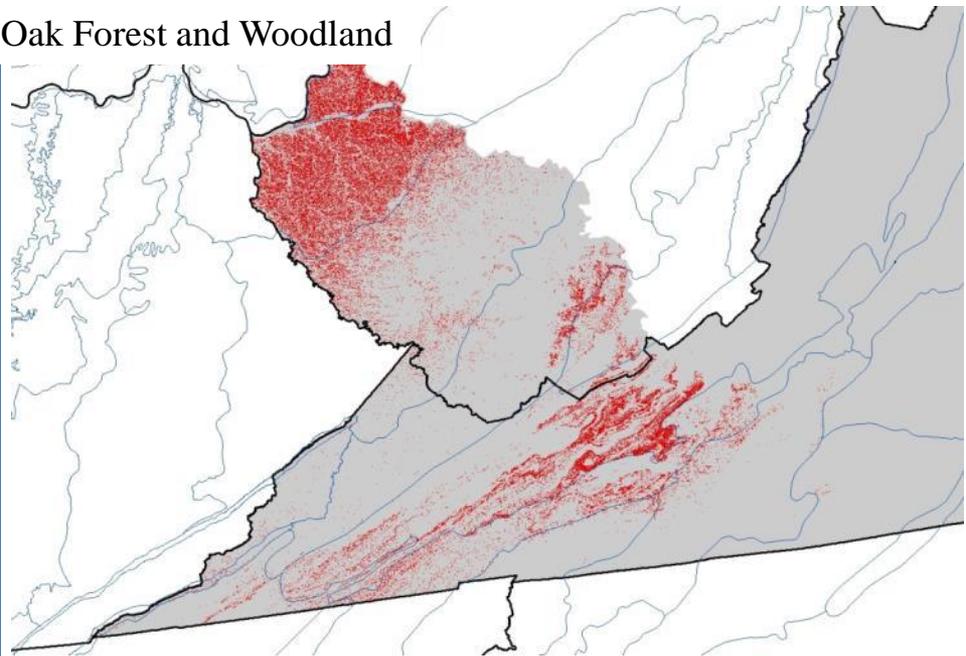
Subsection Analysis in Overlap Area

"Systems"	Count of Subsections where System had > 10% difference in area among protocols.	sq. km				Largest Difference in Area Among Protocols (Brown minus yellow)	Rank of Systems Relative to Difference in Area
		lowest value	highest value				
		evt	nat	segap	tnc		
Allegheny-Cumberland Dry Oak Forest and Woodland	13	388,044,351	1,040,016,753	1,320,777,819	413,881,812	906,896,007	1
Northeastern Interior Dry-Mesic Oak Forest	12	457,819,857	819,422,973	1,151,604,864	1,007,966,835	693,785,007	5
Southern Appalachian Oak Forest	12	323,167,563	237,821,427	276,323,400	929,618,127	691,796,700	6
South-Central Interior Mesophytic Forest	9	867,254,850	229,076,181	88,983,522	400,951,620	778,271,328	2
Southern Piedmont Mesic Forest	9	514,265,679	166,057,128	113,698,080	886,423,824	400,567,599	10
Appalachian (Hemlock)-Northern Hardwood Forest	8	310,758,120	480,270,951	191,871,585	50,815,188	429,455,763	9
Central Appalachian Dry Oak-Pine Forest	8	293,868,567	376,697,628	91,566,045	387,850,599	296,284,554	
Southern and Central Appalachian Cove Forest	8	516,913,731	310,182,210	350,091,315	199,160,046	317,753,685	
Southern Piedmont Dry Oak-(Pine) Forest	7	712,052,370	1,310,533,911	1,386,994,266	654,503,247	732,491,019	3
Managed Forest	5	824,143,167	815,070,762	843,752,052	412,036,146	431,715,906	8
Ruderal Forest	5	706,041,522				706,041,522	4
Southern Ridge and Valley / Cumberland Dry Calcareous Forest	5	13,531,212	195,285,006	379,425,141	325,964,736	365,893,929	
Successional Grassland & Shrubland	3	93,864,339	340,033,059	373,453,092	374,250,699	280,386,360	
Agriculture	2	#####	2,089,780,560	2,094,099,075	2,156,185,494	434,608,416	7
Herbaceous Wetland	2	89,317,161	468,180			89,317,161	
Southern and Central Appalachian Oak Forest	2			94,549,680		94,549,680	
Southern Atlantic Coastal Plain Dry and Dry-Mesic Oak Forest	2	40,762,926	248,569,641	248,569,641		248,569,641	
Atlantic Coastal Plain Blackwater Stream Floodplain Forest	1		129,683,430			129,683,430	
Atlantic Coastal Plain Small Brownwater River Floodplain Forest	1		3,564	3,564	26,685,855	26,685,855	
Northern Atlantic Coastal Plain Basin Swamp and Wet Hardwood Forest	1		52,780,005	52,780,005	83,112,480	83,112,480	
Northern Atlantic Coastal Plain Hardwood Forest	1	77,014,314			233,433,576	233,433,576	
Southern Appalachian Northern Hardwood Forest	1	110,604,609	1,923,912	3,352,104	4,673,943	108,680,697	
Southern Atlantic Coastal Plain Mesic Hardwood Forest	1	356,871,906	253,640,484	253,640,484	407,770,848	154,130,364	

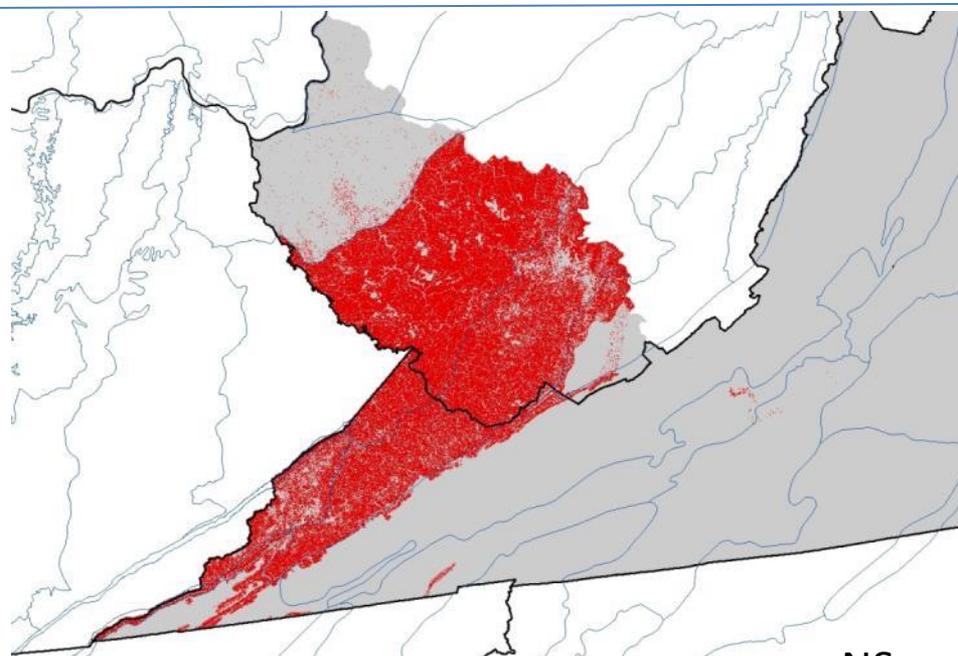
Allegheny-Cumberland Dry Oak Forest and Woodland



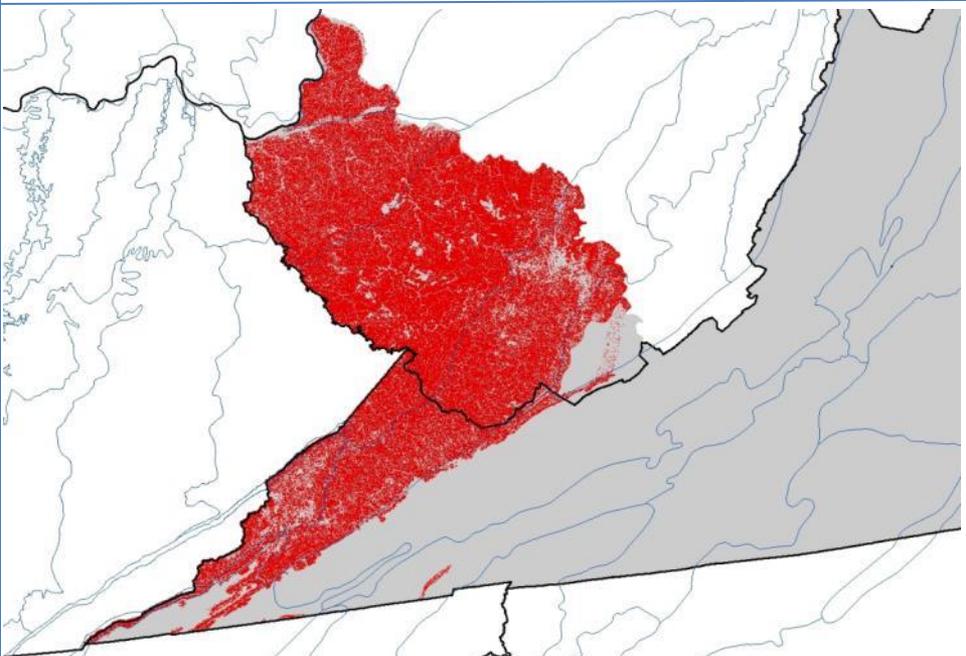
TNC



EVT

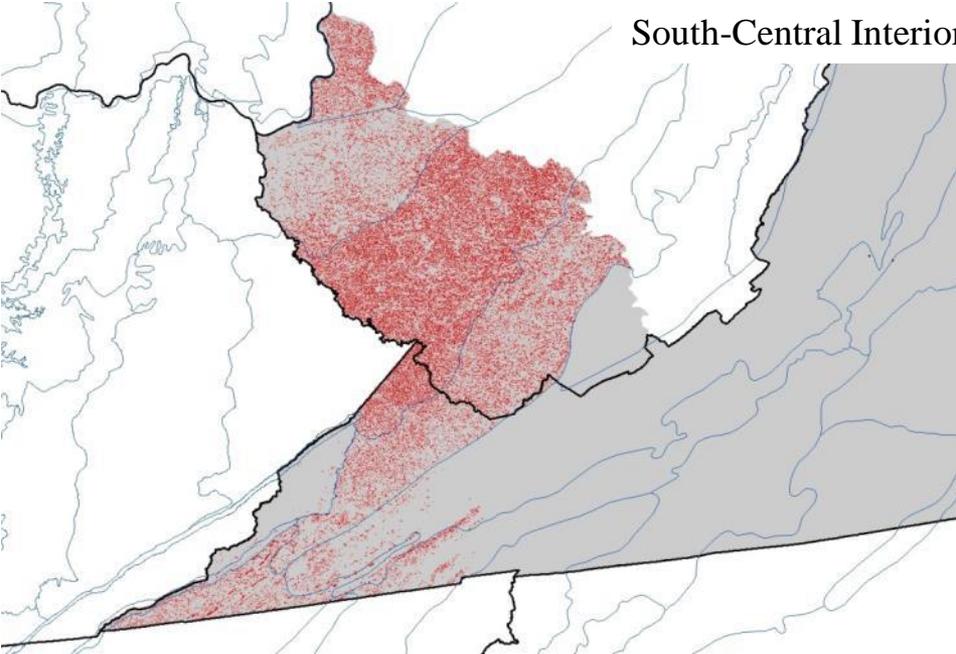


NS

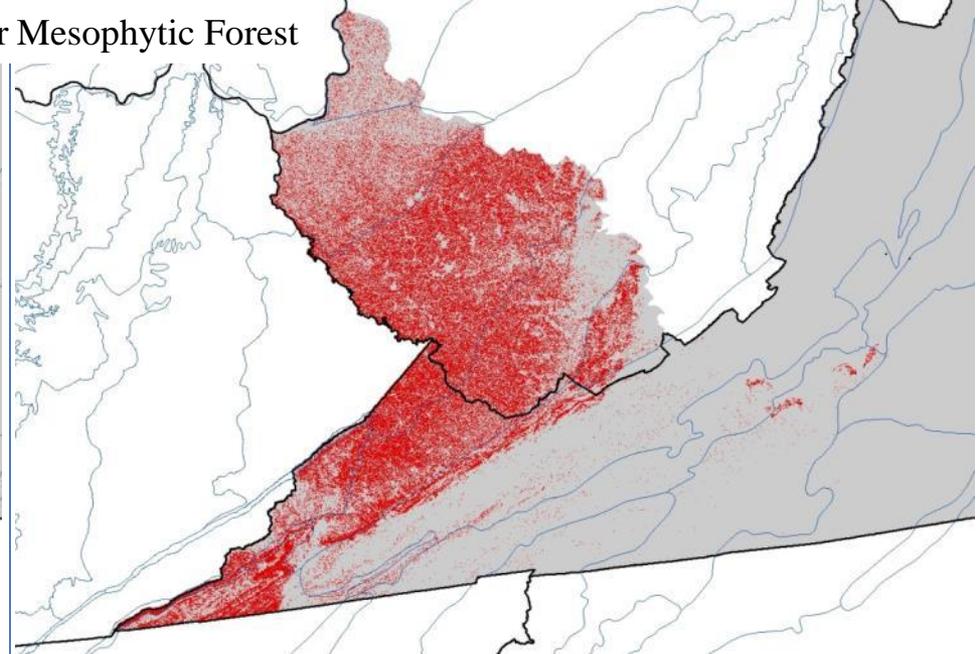


SEGAP

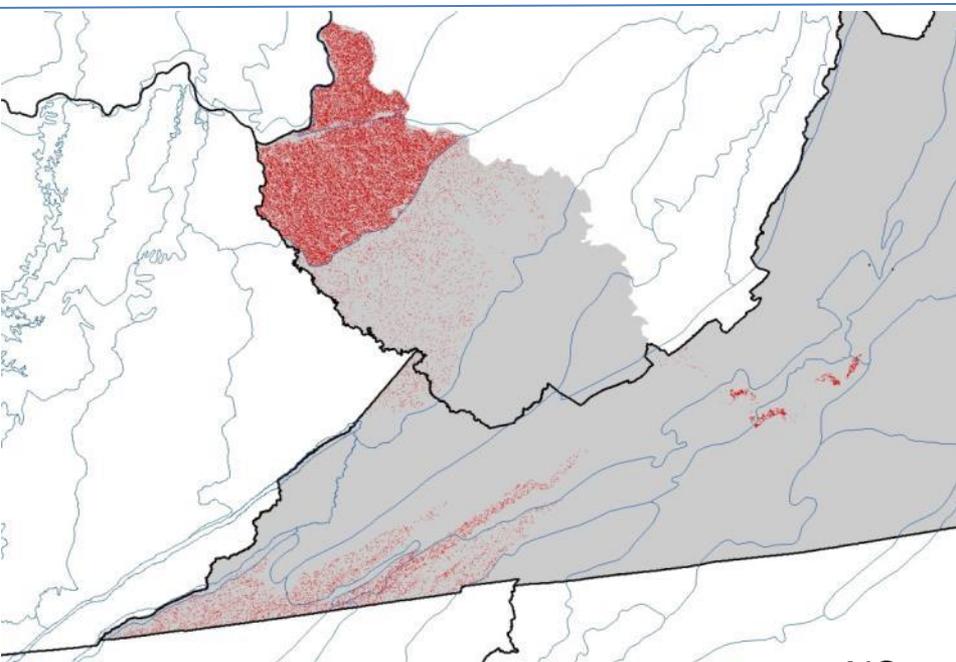
South-Central Interior Mesophytic Forest



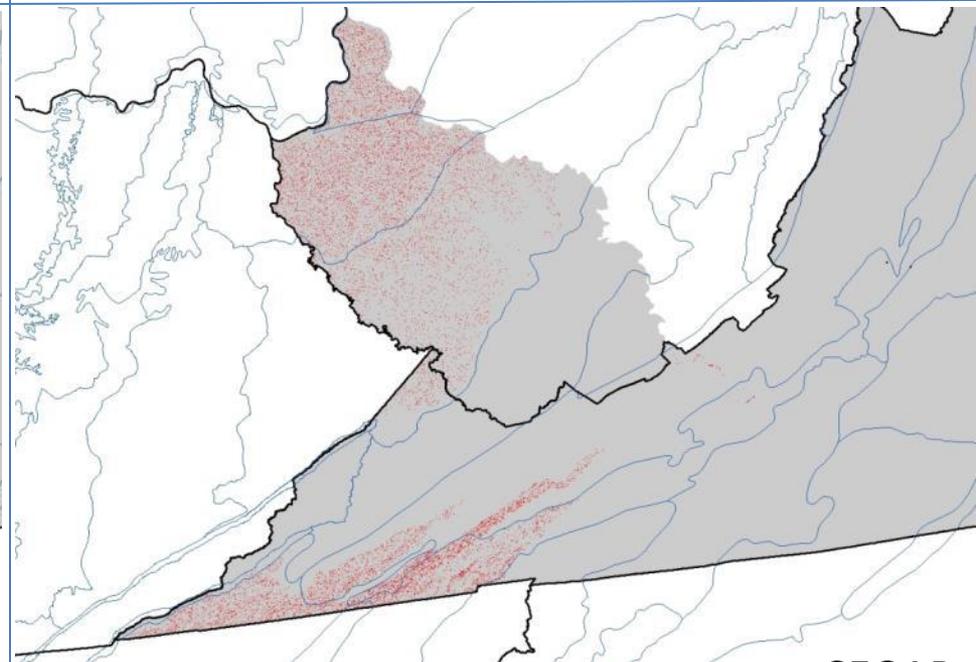
TNC



EVT

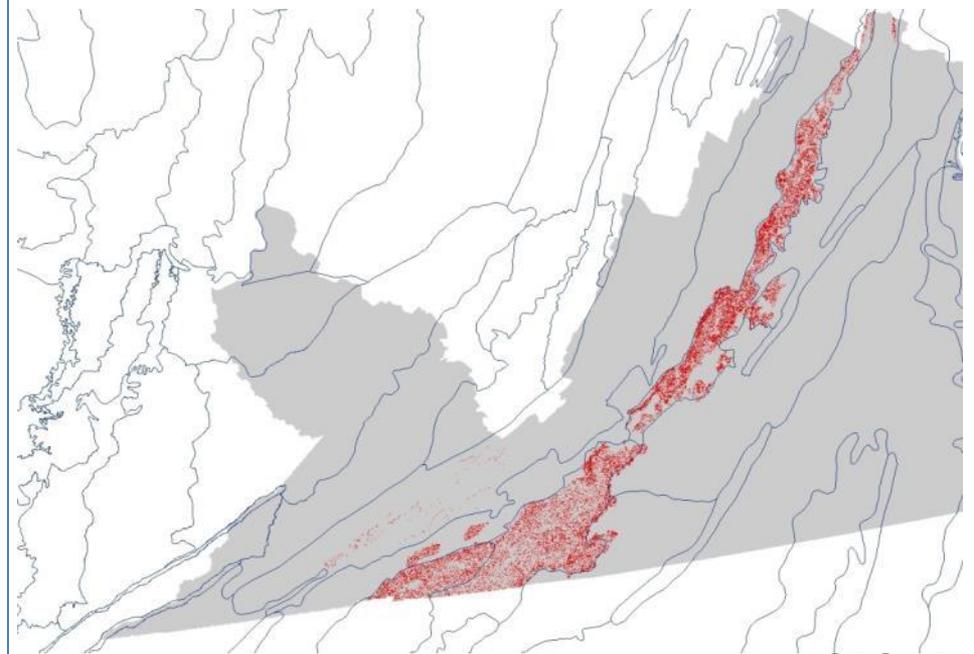
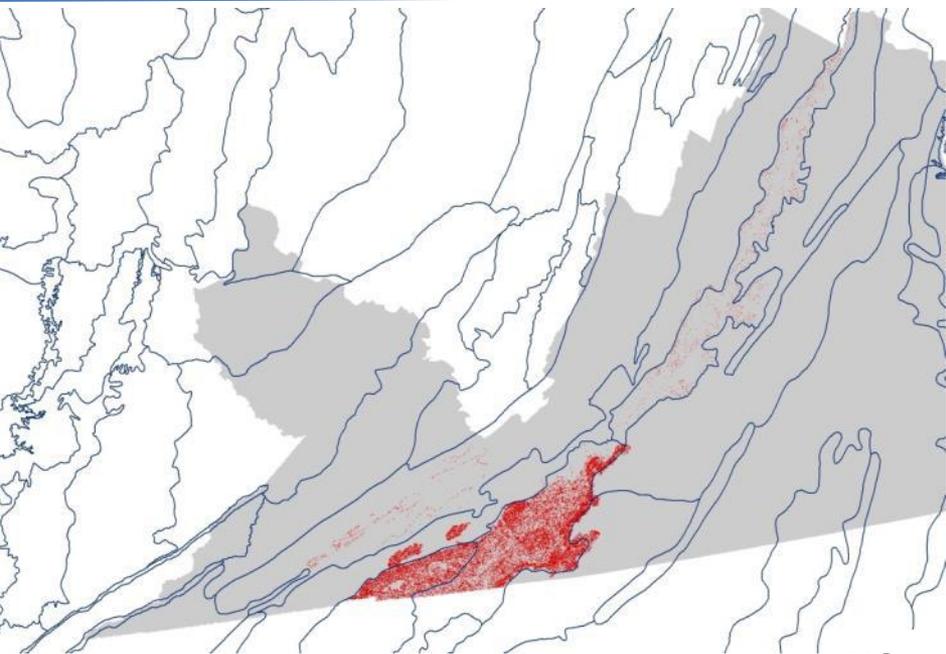
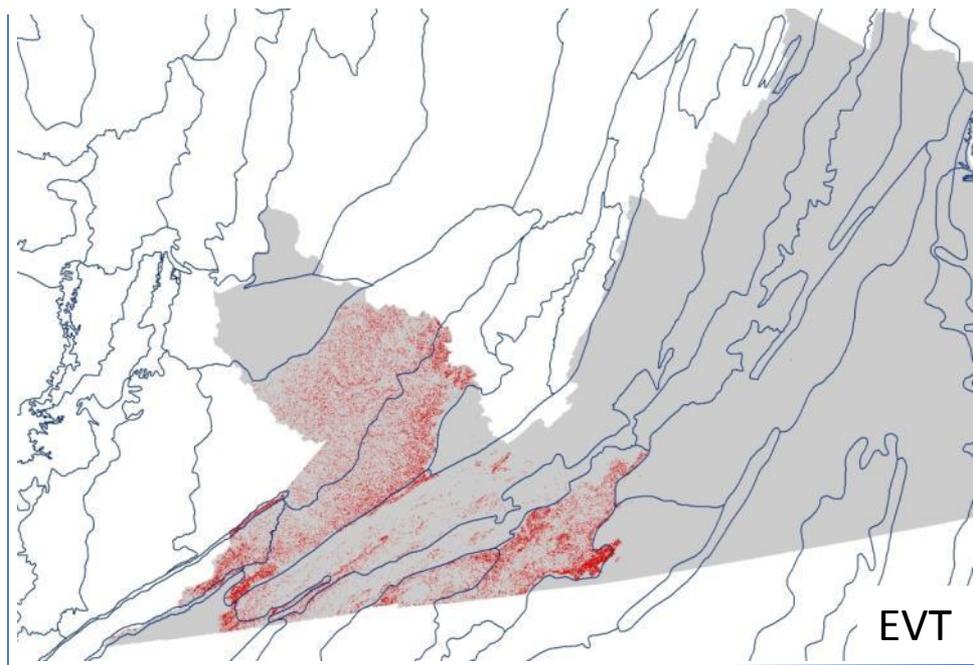
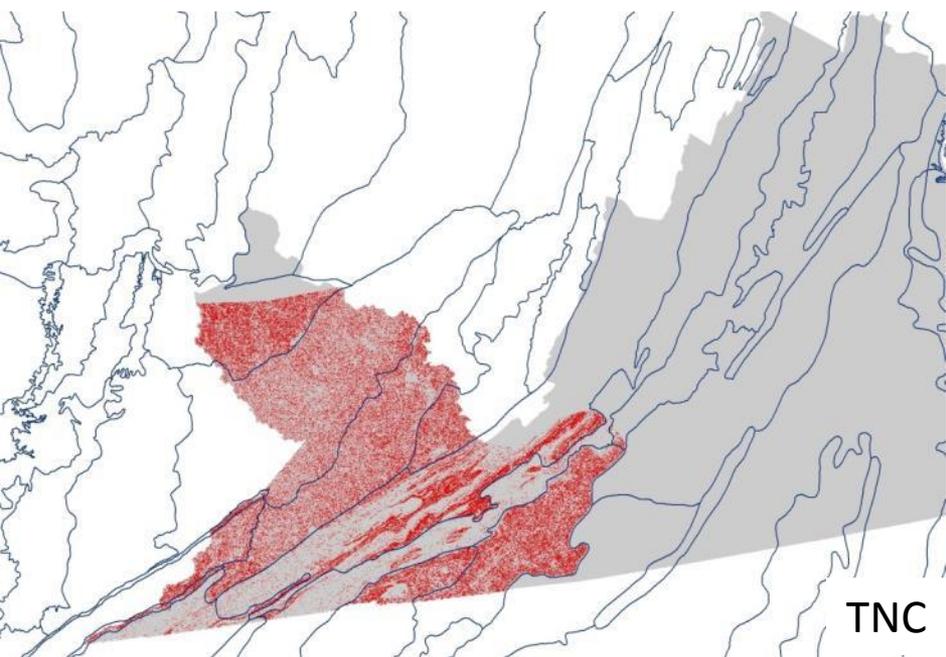


NS

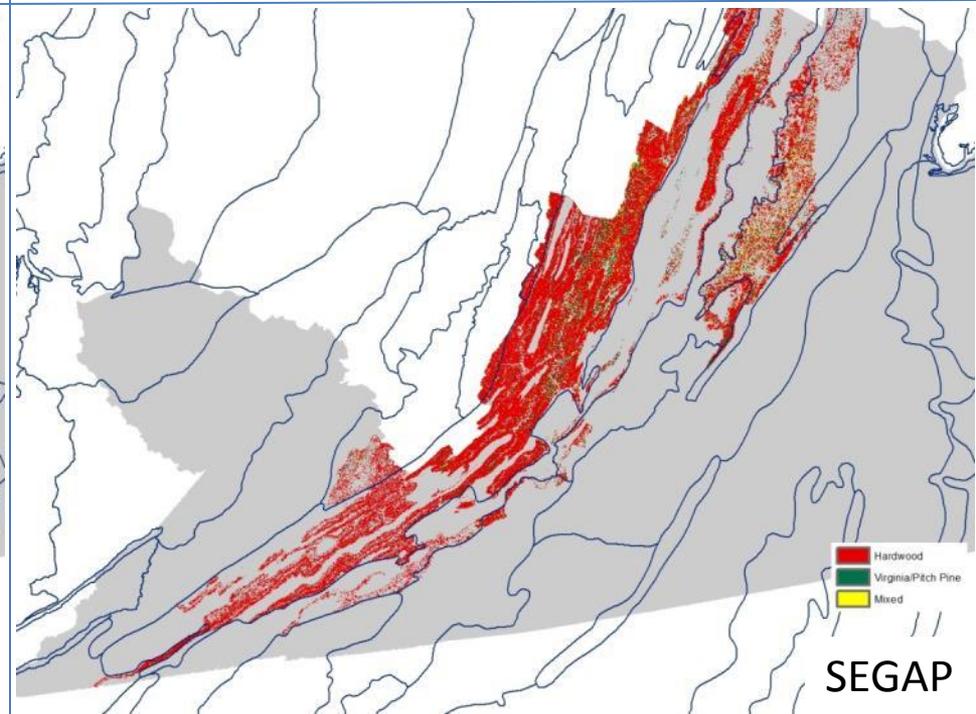
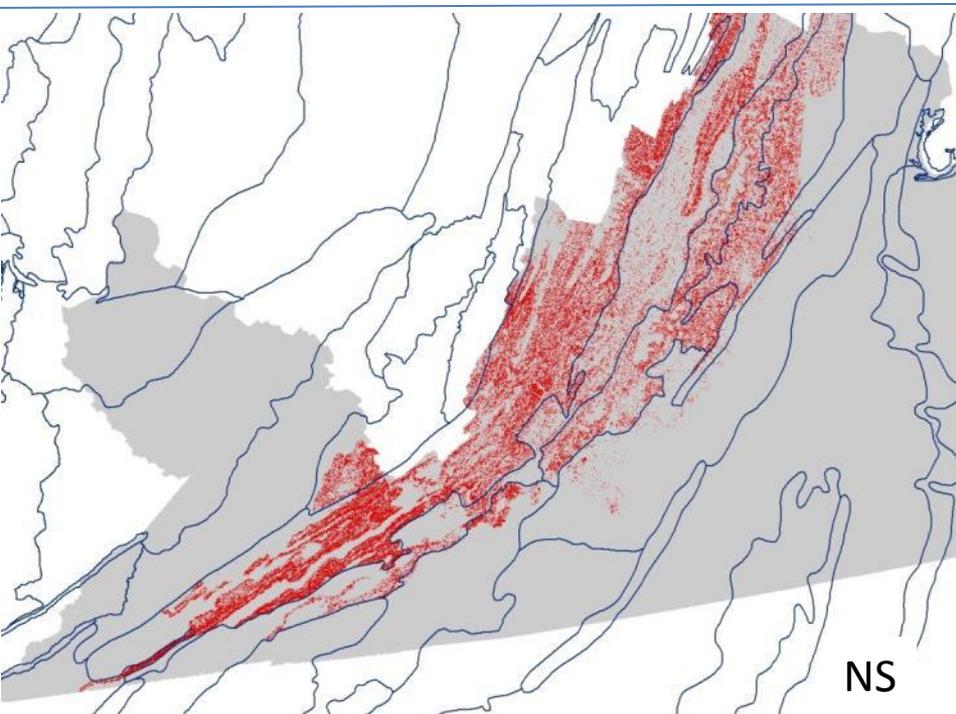
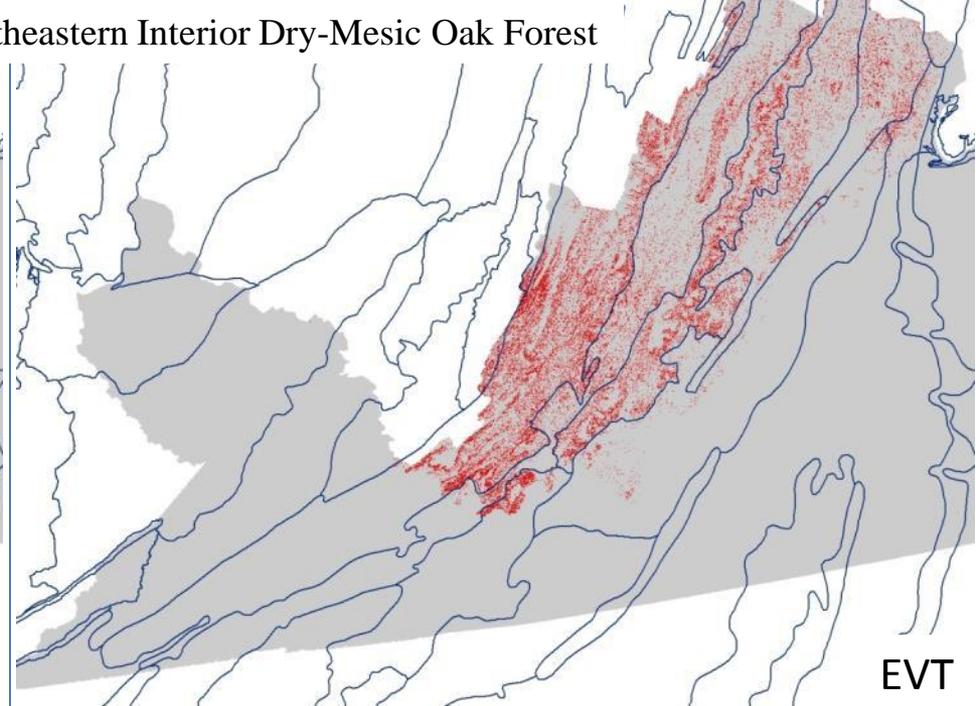
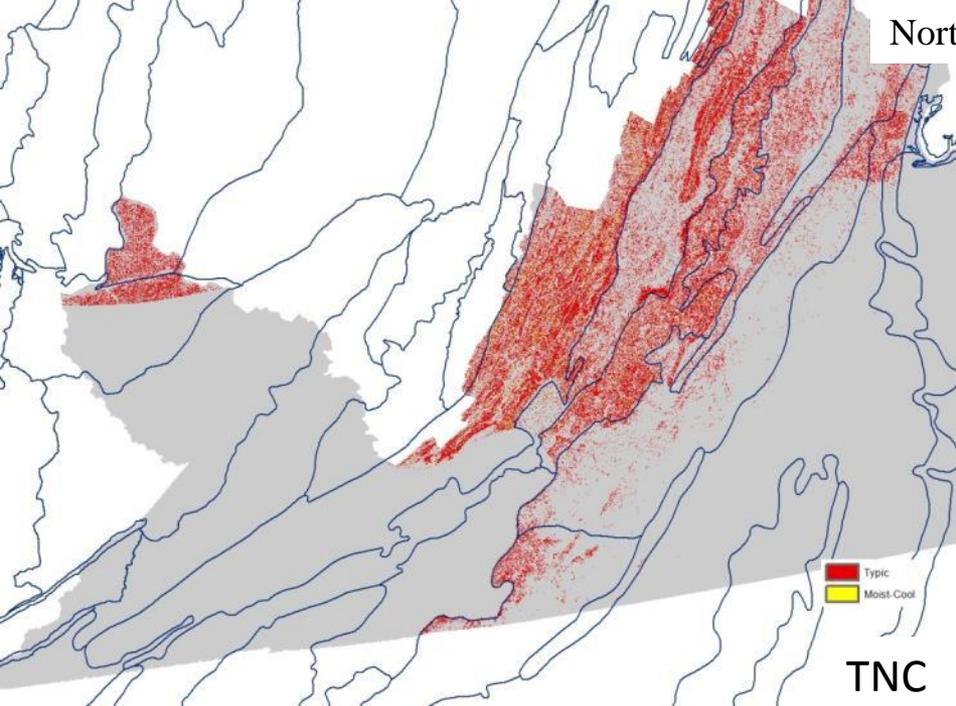


SEGAP

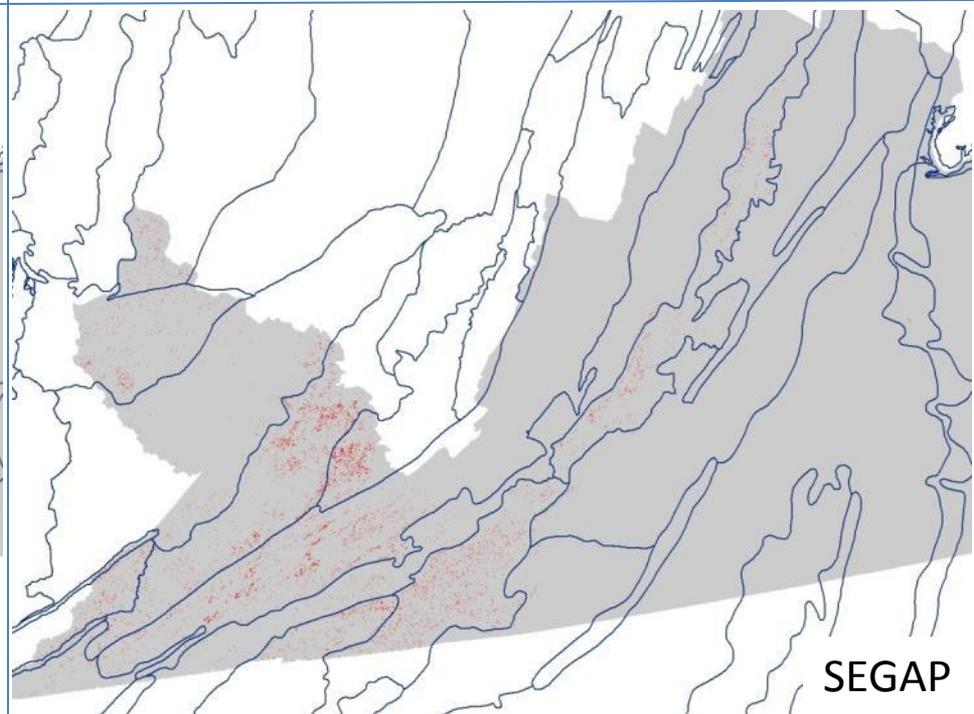
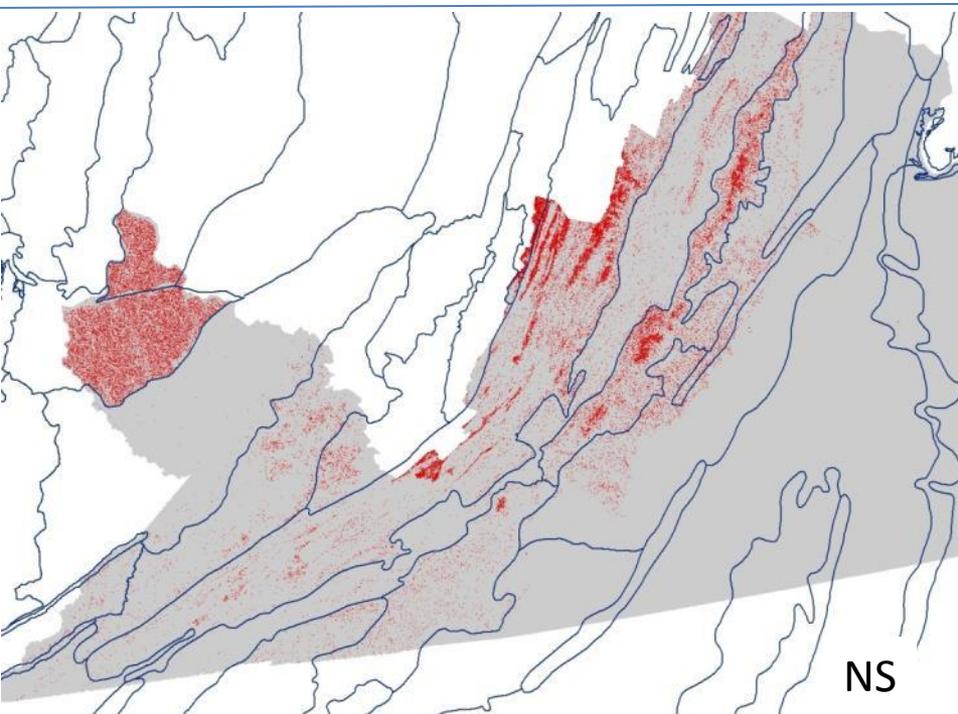
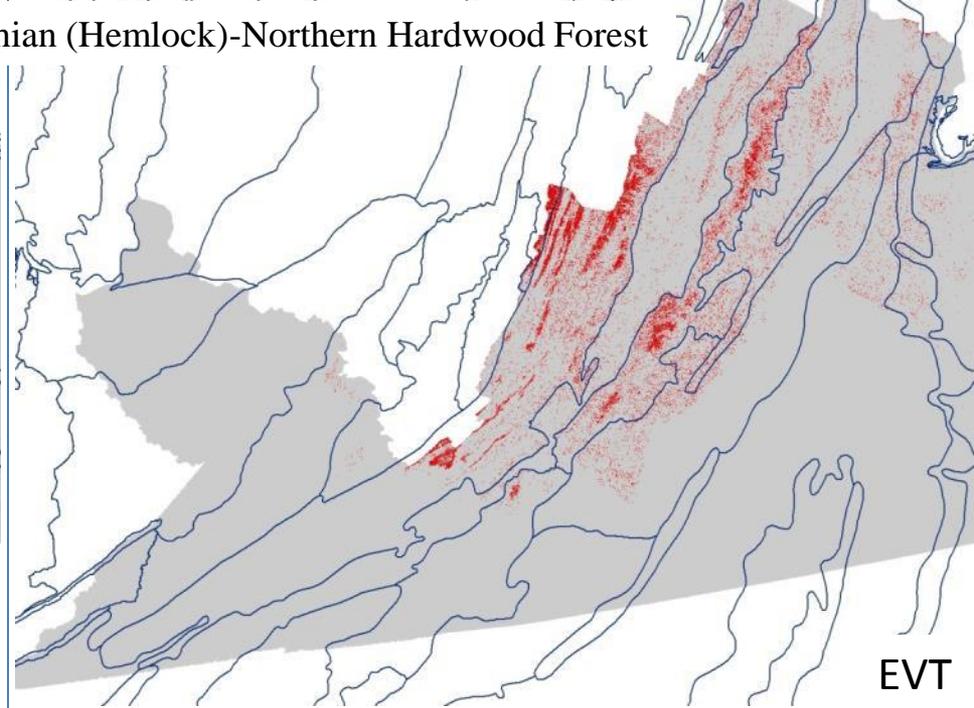
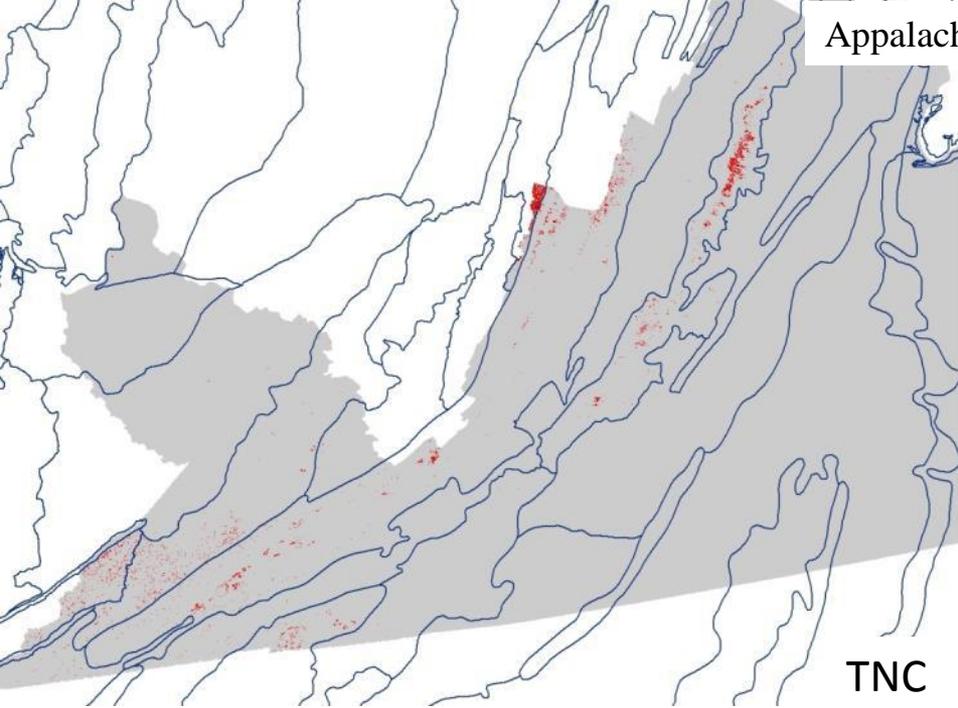
Southern Appalachian Oak Forest



Northeastern Interior Dry-Mesic Oak Forest



Appalachian (Hemlock)-Northern Hardwood Forest



Subsection Analysis in Overlap Area

"Systems"	Count of Subsections where System had > 10% difference in area among protocols.	sq. km				LARGEST DIFF in area AMONG PROTOCOLS (Brown minus yellow)	RANK OF SYSTEMS WITH LARGEST DIFF
		lowest value	highest value				
		evt	nat	segap	tnc		
Allegheny-Cumberland Dry Oak Forest and Woodland	13	388,044,351	1,040,016,753	1,320,777,819	413,881,812	906,896,007	1
Northeastern Interior Dry-Mesic Oak Forest	12	457,819,857	819,422,973	1,151,604,864	1,007,966,835	693,785,007	5
Southern Appalachian Oak Forest	12	323,167,563	237,821,427	276,323,400	929,618,127	691,796,700	6
South-Central Interior Mesophytic Forest	9	867,254,850	229,076,181	88,983,522	400,951,620	778,271,328	2
Southern Piedmont Mesic Forest	9	514,265,679	166,057,128	113,698,080	886,423,824	400,567,599	10
Appalachian (Hemlock)-Northern Hardwood Forest	8	310,758,120	480,270,951	191,871,585	50,815,188	429,455,763	9
Central Appalachian Dry Oak-Pine Forest	8	293,868,567	376,697,628	91,566,045	387,850,599	296,284,554	
Southern and Central Appalachian Cove Forest	8	516,913,731	310,182,210	350,091,315	199,160,046	317,753,685	
Southern Piedmont Dry Oak-(Pine) Forest	7	712,052,370	1,310,533,911	1,386,994,266	654,503,247	732,491,019	3
Managed Forest	5	824,143,167	815,070,762	843,752,052	412,036,146	431,715,906	8
Ruderal Forest	5	706,041,522				706,041,522	4
Southern Ridge and Valley / Cumberland Dry Calcareous Forest	5	13,531,212	195,285,006	379,425,141	325,964,736	365,893,929	
Successional Grassland & Shrubland	3	93,864,339	340,033,059	373,453,092	374,250,699	280,386,360	
Agriculture	2	#####	2,089,780,560	2,094,099,075	2,156,185,494	434,608,416	7
Herbaceous Wetland	2	89,317,161	468,180			89,317,161	
Southern and Central Appalachian Oak Forest	2			94,549,680		94,549,680	
Southern Atlantic Coastal Plain Dry and Dry-Mesic Oak Forest	2	40,762,926	248,569,641	248,569,641		248,569,641	
Atlantic Coastal Plain Blackwater Stream Floodplain Forest	1		129,683,430			129,683,430	
Atlantic Coastal Plain Small Brownwater River Floodplain Forest	1		3,564	3,564	26,685,855	26,685,855	
Northern Atlantic Coastal Plain Basin Swamp and Wet Hardwood Forest	1		52,780,005	52,780,005	83,112,480	83,112,480	
Northern Atlantic Coastal Plain Hardwood Forest	1	77,014,314			233,433,576	233,433,576	
Southern Appalachian Northern Hardwood Forest	1	110,604,609	1,923,912	3,352,104	4,673,943	108,680,697	
Southern Atlantic Coastal Plain Mesic Hardwood Forest	1	356,871,906	253,640,484	253,640,484	407,770,848	154,130,364	

Southern Piedmont Dry Oak-(Pine) Forest

